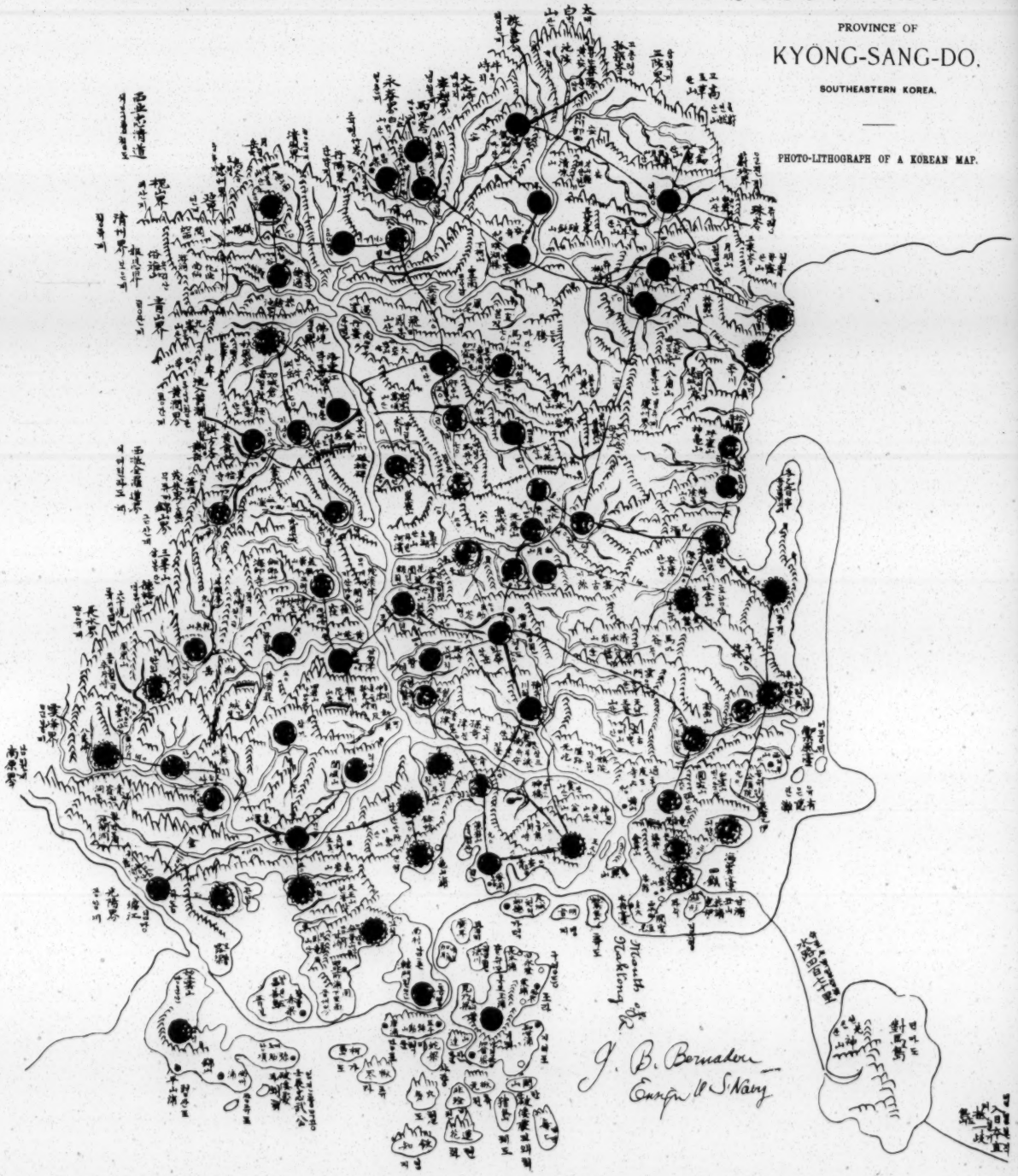
KOREA.
Photo-lithograph of a Korean map (in colors), reproduced from one in the possession of Mgr. J. G. Blanc, French Missionary Bishop of Korea.
TOWNS,
WALLED TOWNS,
MOUNTAINS,
SIGNAL FIRES,
J B Bernadou
Engr U.S.Navy


PROVINCE OF
KYONG-SANG-DO.
SOUTHEASTERN KOREA.
PHOTO-LITHOGRAPH OF A KOREAN MAP.
Mouth of Makiong
J. B. Bernadou
Ensign U. S. Navy

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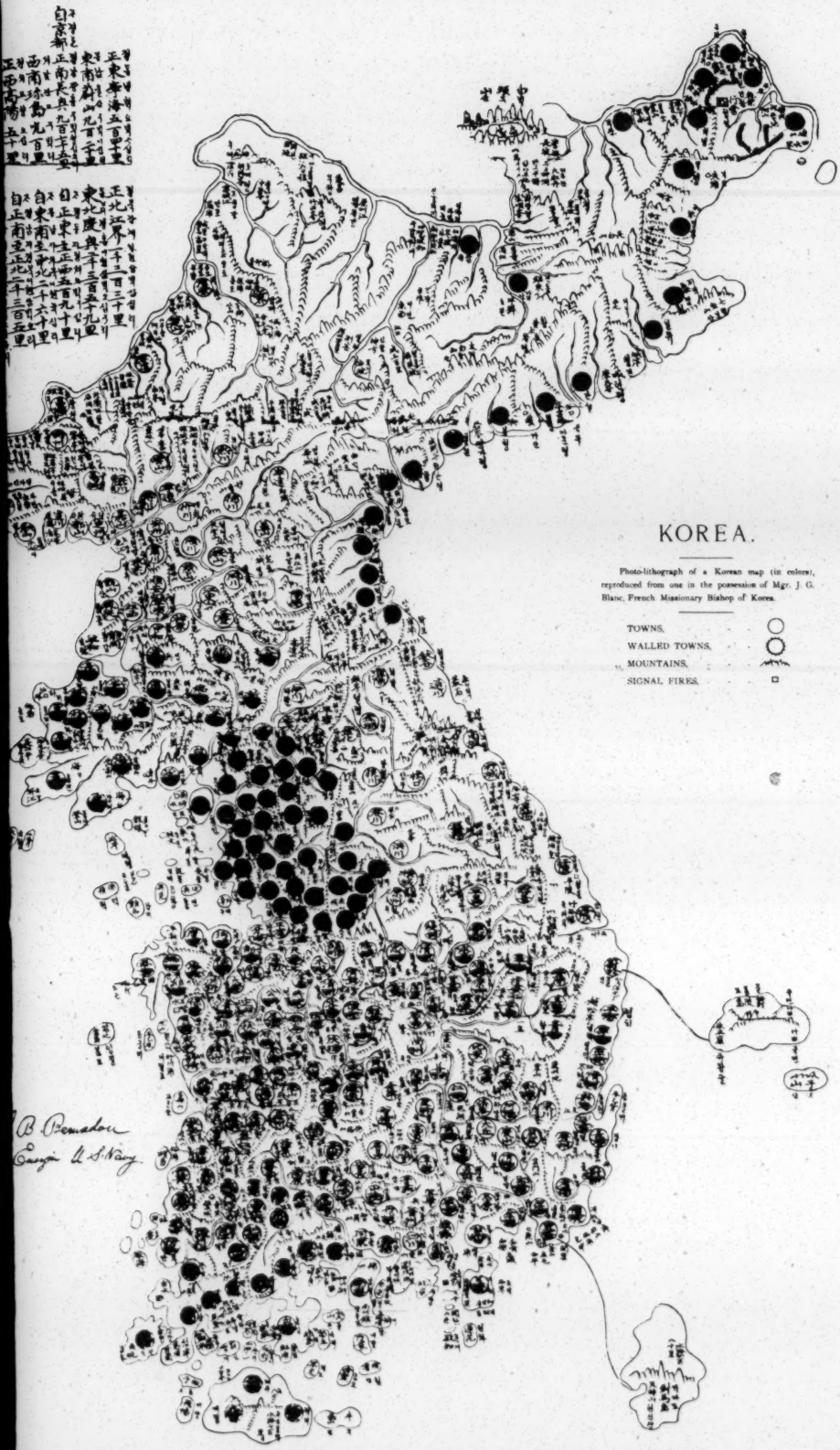

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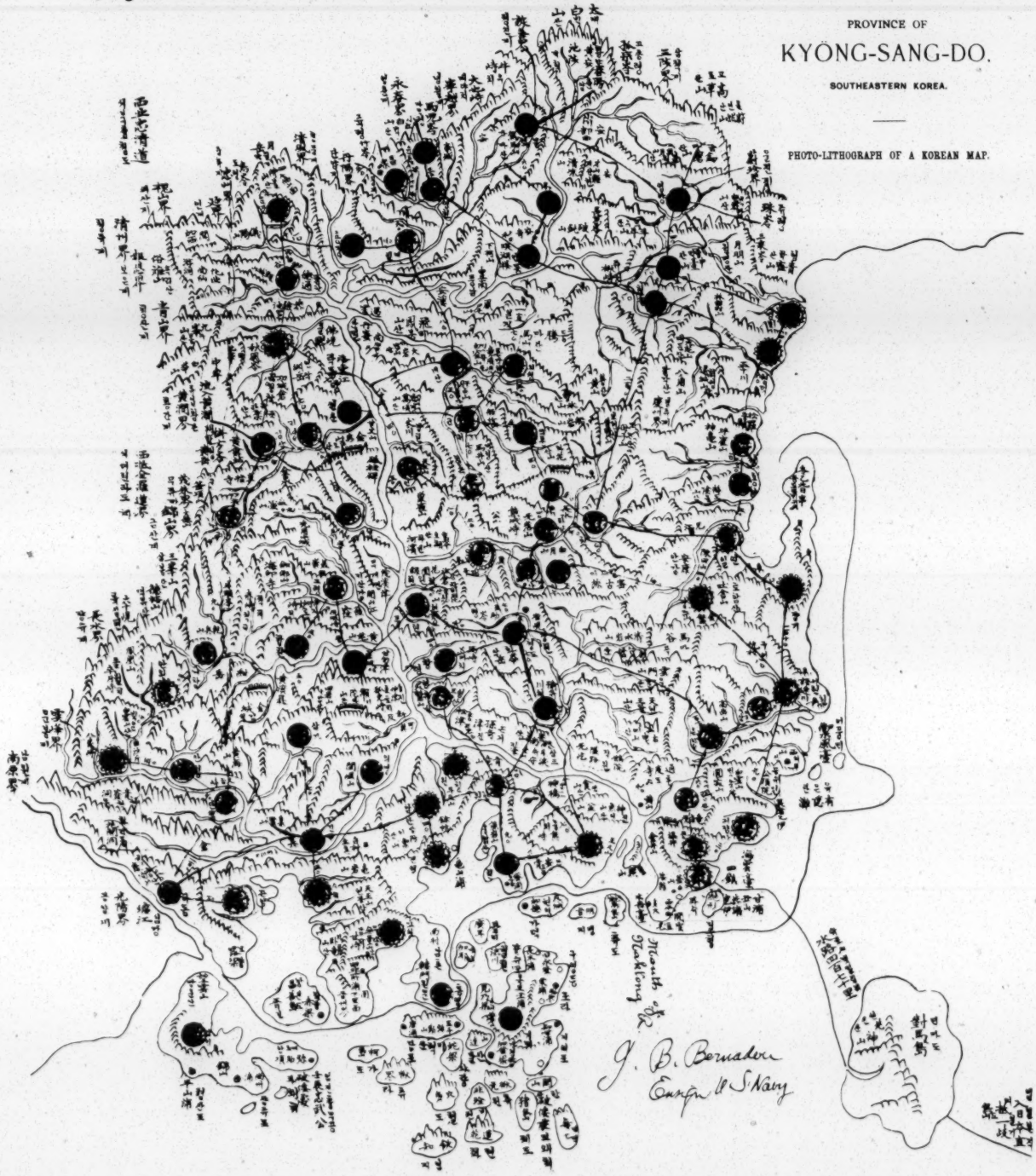

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KOREA AND THE KOREANS.

By J. B. Bernadou.

(Abstract of lecture, with the addition of some new material.)

The Koreans are to be noted among nations for the possession of two very different vehicles for the expression of thought, which they put to nearly parallel uses for general needs of communication : a simple and very perfect alphabet, and a complex system of hieroglyphics. The alphabet they owe to the Buddhist priests, missionaries, who took the idea of letters from their sacred books, and developed the Korean symbols for the writing of tracts and prayers ; the hieroglyphics came from the mother country and civilizer, China.

The needs of a simpler mode of writing for the intelligent, non-literary classes of Japan, had led in that country to a similar development ; but there progress stopped at a syllabary, and the alphabetic stage was not reached.

Until within the past few years the development of accurate maps and charts of Korea has been retarded, partly from a lack of reliable information concerning Korean proper names, and partly from the absence of systematic surveys of the coast. Very recently, however, the difficulties of map making have been considerably lessened through the efforts of students of the Korean language, who have developed exact systems of transliteration,

by the application of which the sounds of Korean proper names may be correctly expressed in our own letters. At the present day it would seem possible, therefore, to fix, by common consent, upon a general, systematic orthography for Korean proper names, to be used upon the charts prepared by all those nations employing Roman letters; and this without serious danger of clashing with previously developed national systems, or having to undo much work done by others.

The system of transliteration developed by Mr. E. M. Satow, of the British Diplomatic Service, which has been put to practical use by that gentleman in his work entitled "List of Korean Geographical Names," would seem well adapted to meet future needs. It gives a simple series of equivalents for Korean sounds, and is remarkably free from diacritical marks. Mr. Satow's system has recently been employed by English and German authors, while efforts to extend its application would seem to have met thus far with no opposition.

The French system of transliteration, which antedates the one above referred to, was developed by the French Roman Catholic Missionaries in Korea, and has been employed by them in their admirable works the "Grammaire Coréenne" and the "Dictionnaire Coréen," by far the most important yet prepared upon the language, and the first given to the outer world. The missionaries aimed at reproducing native speech, and to this end faithfully copied symbols representing shades of sound that are not to be appreciated by the foreign ear, and which in fact are often neglected in conversation by the Koreans of the present day—for the Ön-mun, or native alphabet, has long since lost its purely phonetic character. The simplicity of the French system is marred, therefore, by the use of a multiplicity of letters, which, appearing in the form of aggregations of consonants or of vowels, are more apt to mislead than to guide.

Inasmuch as the proper names upon native maps, which are invariably written in the Chinese, may be correctly rendered into English, whereas attempts at the systematic transliteration of Chinese characters have generally failed, it may be well to allude to the points of difference in the two cases. The possibility of the transliteration of Korean depends upon the following: (1) that the Korean pronunciation of Chinese characters is independent of the pitch of the voice or *tone;* (2) that the native alphabet is especially constructed with a view to the easy reproduction

of the Korean pronunciation of the same ; (3) that the Korean pronunciation of these characters is quite uniform throughout the whole extent of the country ; (4) that the Korean equivalents may be readily transliterated into English. All that is necessary, therefore, in fixing a geographic name is to have it written correctly in Chinese and in the Ön-mun. From the latter the English equivalent may be readily obtained. The need of the Chinese form arises from the fact that but few of the natives spell correctly, while many of them write Chinese well ; so that it becomes necessary to refer both writings to some authority, by whom the native spelling may be verified.

Wide spread as is the use of the Chinese nomenclature, it is none the less evident that the system is an artificial one, and that its employment must end somewhere. In those parts of the country that are the least explored, and where educational facilities are wanting, in the mountain fastnesses of the north, and among the many islands of the Yellow Sea, important geographic names occur that possess no Chinese equivalents : native words capable of being written only in the Ön-mun and which derive their origin from local peculiarities. To ascertain these correctly the services of an educated Korean are required ; and it may be added here that no surveying party on the Korean coast should be without the services of a native guide, capable of speaking a few words of English. Such a man may be picked up at an open port. He would be useful in many ways : in preventing the destruction of signals from superstitious motives by the natives ; in ascertaining from fishermen the existence of dangers in the intricate coast waters ; in marking the position of towns and villages not to be seen from their sea approaches ; and in securing supplies of fresh provisions.

The preliminary study of the geography of an eastern country necessitates the comparative examination of data gathered from widely different sources : the early partial surveys of the coasts by mariners, and the rough maps made by the natives themselves. Inasmuch as large sections of the Korean coasts are as yet hardly examined, and since it is only within the last few years that foreigners have been allowed to penetrate into the interior, it follows that no accurate map of the land exists. In selecting bases for future developments it becomes necessary, therefore, to examine the various approximate representations, and to determine which of them is best adapted to aid the work in hand.

Many writers upon Korea seem prone to attribute the mapping of the country to the result of explorations and observations made by foreigners. I believe this assumption to be erroneous and think it can be readily proven that, although the Koreans may have known practically nothing of the outside world up to the time of the treaties, some twenty years ago, they had, nevertheless, long before this formed an excellent idea of the configuration of their own country. The first important work accomplished by outsiders was the survey of the common boundary of Korea and China by the Jesuits, acting under the orders of the Chinese Emperor Kang-hsi, in the year 1709. Severity of climate and roughness of country prevented the party from making more than a preliminary examination of the districts that they passed through, but a few fair determinations of latitude and approximations to longitude were obtained, and the general direction of the boundary determined. With the aid of these data, supplemented by information from native sources, a map was constructed, in which the Korean peninsula was connected with the general system of the world's coördinates and proper names were given in our own alphabetic characters. This map, which forms the basis of most of the representations of Korea in use at the present day, shows its origin in the transliteration of proper names in accordance with the Mandarin Chinese and not the Korean pronunciation of the Chinese characters employed to represent them.

The information from Korean sources which the missionaries must have utilized in completing their work was doubtless attained by them in the form of native maps. Of these there are several good ones in use at the present day, two of which would seem especially worthy of notice: (1) the large map of twenty sheets dividing the peninsula into sections by parallel lines drawn from east to west, and (2) a map giving the country in eight sheets, by provinces. The key to the latter, showing the entire kingdom, as well as one of the expanded sheets showing the Kyöngsang province in the southeast, and the Nakdong river, the most important stream of the land, are appended to this paper, and will serve to indicate the progress independently attained by the Koreans in the art of map making. These plates have been reproduced from a copy of an original now in the possession of Mgr. J. G. Blanc, the French Missionary Bishop of Korea, to whom it served as an accurate guide at the time of his

perilous entry into the country, fifteen years ago, during a period of severe persecutions.

The preface of the Korean geographer, which is written in Chinese upon one of the sheets, is of interest, as it illustrates the object of the work, enumerates the classes of data utilized and alludes to difficulties contended with. I therefore quote it here.

"The geographies of my country are quite numerous, but all maps are influenced to a certain extent by the limit of the paper employed in their construction, and so distances are very incorrectly given. Thus ten or more ri (Korean unit of distance—about $\frac{2}{5}$-mile) are sometimes represented as two or three hundred ri; while sometimes two or three hundred ri are represented as two or three. The bearings given are also incorrect. Such a map offers great disadvantages to people who attempt to learn about their country. Therefore I have taken all care in constructing this one, both as to direction and distances of places, as well as to the situations of mountains and rivers. For distances I have made a scale in which one hundred ri are taken as one ja (Korean foot), and ten ri as one poun (Korean inch, ten to the foot). I have laid off distances in all directions from the capital, so that the general shape and position of the eight provinces are correctly represented. The islands, however, are only placed in direction with reference to the provinces to which they belong, without regard to actual distances. Where mountain ranges and rivers are represented as boundaries, they are necessarily repeated upon the sheets of adjoining provinces. In the measurement of distances one ja represents one hundred ri in level places, and from one hundred and twenty to one hundred and thirty ri where the mountains are high."

The assumption that the unit of scale represents an increased distance in mountainous regions is a peculiarity of Chinese as well as of Korean maps. Travelers who employ either are obliged in estimating days' journeys to consider the character of the country ahead before applying the unit of measurement.

An examination of the various conventional features of Plate I and II will afford much information concerning the official subdivision of the country for governmental purposes, and will serve to indicate the facilities of communication that exist in a country where there are no railroads, and where almost every important route extends in a direction normal to that of the flow of the greater number of rivers. The eight provinces of the kingdom

are exhibited upon Plate I as groups of towns, each group being displayed upon the original in a different color, all of which, as shades of various intensities, are fairly well reproduced upon the photo-lithographs. Each town is denoted by a circle of very exaggerated dimensions, large enough to allow its name to be written in Chinese characters in the enclosed area. The apparent multiplicity of characters upon the present map is due to the fact that all names are given in the native Ön-mun, as well as in the Chinese. The employment of the former is unusual and in the present case was resorted to at my own instance, in order to render the map more generally useful to foreigners. Each town is the seat of government of an officer who is subordinate to a provincial governor. The strength of any portion of Korea may therefore be reckoned in the native way as so many "cities," by the word "city," being understood both the seat of government and the adjacent lands over which the governor holds sway. The walled towns, which are quite uniform in type throughout the whole extent of the country, deserve especial mention. They are represented on the map as circles with serrated edges, and a glance at the provincial sheets will show that they are quite numerous, each province possessing from six to twenty of them. The number is greatest along the coast of the Yellow Sea and to the southward, facing Japan.

As secondary fortifications may be mentioned the San-söng, or mountain walls, as they are called, built at the least accessible points of the interior ranges, generally in proximity to some thickly settled district. The more ancient are relics of the feudal period, when Korea was governed by petty princes each with his castle upon a rock; the more modern, witnesses of the Japanese invasion of two hundred years ago, when they were either pillaged by the enemy or else held by the people as places of refuge. A number of the San-söng are marked upon the present map; those of lesser importance are omitted.

Not the least curious among Korean institutions is the system of communication maintained at the present time. At the yok, or post stations, represented on the map by diminutive circles, are kept numbers of the small active native horses, well fed and in good condition, attended by staffs of native couriers who are ready to receive orders from the station-master and spring into saddle upon a moment's notice. The service is well patronized and the couriers frequently employed, partly at the instance of

the government, who desire to promote the efficiency of the system, and partly owing to the general accumulation of private needs of various kinds. A letter or parcel is thus rapidly transmitted from relay to relay, moving onward by day and night—except in certain mountainous districts of the north, where the fear of the tiger prevents night travel. Supplies of fruit and game for the royal table are forwarded in this manner to the capital from the most distant parts of the kingdom.

The pong-wa, or signal-fire stations, are indicated upon the map by small squares placed at the summit of the mountains. They are especially numerous in the coast districts, where their sites are chosen with great care, in such manner that the fires that are lighted at each station at night-fall may be observed at some advanced point of the interior, whence a single fire may be again flashed on, to form a member of a more extended group. And so the lights proceed, re-collected and re-forwarded until the final combinations are gathered into a final group at the capital, to show that all is well throughout the kingdom.

The faint network of lines extending over the whole country, as shown in the map of the southeastern province, represents the chief public highways, upon the determination of whose length and relative bearing the development of the map is based. In general, roads in Korea are well maintained, and during the greater part of the year are in fair condition. It would be found impossible to take a wheeled vehicle of any kind over them, however ; for such use they are not intended, travel in Korea being performed afoot, or with the aid of horse or sedan. During the summer rains the streams rise rapidly ; the waters pour down from the mountains, each rivulet becomes a torrent and the bridges are swept away. When the floods subside the local authorities compel the peasants to turn out in force and make the necessary repairs ; delays of travel are thus reduced to a minimum.

Korea is preëminently a mountainous country. With the exception of the alluvial plains at the mouths of the rivers, low ranges of mountains with narrow intervening valleys are found everywhere, and are characteristic. The main chain, forming the back-bone of the peninsula, is not clearly defined, as it is formed principally by the overlappings and intersections of minor chains, so that it is quite irregular as to direction, but a glance at the sources of the rivers, considered with reference to the intervening line of water-sheds, shows that it springs from the mountains

of Siberia at the north, follows for some distance the line of the eastern coast and then strikes inland, trending to the southward and westward until it reaches the shores of the Yellow Sea. The loftiest ranges, therefore, are in the northern and eastern provinces. At the centre of the northern boundary is Paik-du-san, the "white-headed mountain," in whose slopes rise the Yalu, Tuman, and Songari rivers, the two former defining the western and eastern sections of the frontier, the latter a tributary of the Amur, an important stream of southern Siberia. According to Messrs. James, Younghusband, and Fulford, of the British Indian and Consular services, who visited it in May, 1886, Paik-du-san is "a recently extinct volcano with a lovely pellucid lake filling the bottom of the crater, surmounted by a serrated edge of peaks rising about 650 feet above the surface of the water. The height of the loftiest of these was found to be about 7,525 feet above the level of the sea."

Besides the rivers of the frontier are others of the interior that deserve a passing mention. The mountainous nature of the country, as well as its proximity to the sea, implies the existence of numerous secondary water courses, but these as a rule are insignificant in size and so shallow as to permit of navigation only throughout limited portions of their extent. Among the larger streams that lie wholly within the country is the Taidong, flowing through Phyŏng-an-do, the northwestern province, rising in the central ranges of the peninsula and flowing into the Yellow Sea. During the greater part of the year it is navigable as far as the city of Phyŏngyang for native craft of the largest size. In midsummer its waters rise rapidly during a short rainy season; then quickly subside, the river resuming its former limits. To this sudden shoaling may be attributed the loss of the schooner Sherman, captured by the Koreans in 1871, the vessel going aground without warning at a place where a few hours before abundant water had been found.

The Han, the river of the capital, lies about one hundred miles to the southward of the Taidong, and flows westwardly in a nearly parallel direction thereto, from the central ranges of the peninsula into the Yellow Sea. Its many branches join in a common estuary near the centre of the Yellow Sea coast, and their collective drainage area comprises a large portion of central Korea. Still farther to the southward is the Keum, traversing a fertile rice-growing country, while at the extreme south is the

Nakdong. The latter is one of the most important streams of Korea, and the facilities that it affords for communication and interchange have done much towards rendering the district through which it flows one of the most fertile and prosperous of the land.

The coasts of Korea are forbidding to the mariner and seem well adapted for the preservation of the seclusion that it has been so long the national policy to maintain. On the east, facing Japan, unbroken lines of steep hills, void of harbors, bend abruptly into the deep waters of the Japan Sea. To the westward countless outlying islands extend seaward many miles, liberally interspersed with rocks and shoals, between which eddy swift streams of tide-water. The terrors of the Maelstrom would find their counterpart in many a Korean whirlpool, which, forming in the vicinity of some submerged ledge, will cause a large vessel to heel suddenly well over, and will swing her many points off her course in a way to make the stoutest hearted captain tremble for the safety of his charge.

The climate of Korea exhibits wide ranges of temperatures and hygroscopic conditions. In the northeast province, Ham-kiung-do, the winter is as rigorous as that of Nova Scotia; at the extreme south, on the island of Quelpaert, it somewhat resembles that of Louisiana. The warmth of Quelpaert is due to the proximity of the Kura-siwo, or Black Stream of Japan, the Gulf Stream of the Pacific, part of which is here turned into a cul-de-sac, from which it escapes with difficulty. One result of this is the creation of a stormy region near the island, where the mariner may at all times look for a hard blow. A characteristic feature of Yellow Sea coasts are the Chang-ma, or mid-summer rains, which set in with fair regularity in July and during their month's duration resemble in phenomena and general effects the periodic rains of the tropics. The winters, in all but the southern parts of the country, are long and severe and set in with great suddenness. As an illustration of the rapidity of this change I remember that on one occasion I was ferried across the Han river near the capital at a time when the only indication of cold weather was a film of ice along the river banks, and that within forty-eight hours afterwards I rode back across the river ice on horseback, over the line of the former ferry.

Careful meteorologic records have now been kept at the open ports for more than five years; at Che-mul-po, on the Yellow

Sea (the seaport of the capital, Söul); at Fusan, to the south; and at Gensan, to the northeast. Stations are needed on the Yellow Sea coast farther to the northward, at the extreme northeast, at points in the interior, and especially on the island of Cheju, or Quelpaert, whose weather reports may some day prove as valuable to the Japanese as those from Bermuda would now be to the navigator of the western waters of the Atlantic. All the above mentioned places are easily accessible and doubtless soon will receive attention. In fact, to the navigator of these regions this island of Quelpaert is almost of the importance that Hatteras is to the navigator of our own coast.

As an important factor of Korea's future prosperity, and one that will enter largely into the determination of her future position among the nations of the east, may be mentioned her mineral resources. These yet remain in an almost undeveloped condition. The most easily accessible deposits and out-croppings, which are worked by the natives in primitive ways, afford evidence of an abundant and varied supply of the useful ores and minerals widely distributed throughout the whole extent of the land. Many localities, moreover, are well known to the people for their especial products. Thus the Phyöngyang province, in the northwest, facing China, possesses abundant deposits of coal, iron, and lime. Samples of this coal, which is but little used by the people, were collected several years ago from twelve different localities, and I remember that some of the Phyöngyang gatherings were tested on board the U. S. S. Alert, but were found to have suffered so greatly from exposure to the weather as to be comparatively valueless, even for experimental purposes. Limestone is common in this district, and in the town of Phyöngyang I have noticed the use of caustic lime in the streets as a disinfectant. The iron produced at Yöngpyön, fifty miles to the northward of this city, which is reduced in the native way with charcoal, is remarkable for its malleability and purity. Inasmuch as all these deposits are of very great extent and lie near the sea coast, and in proximity to waters easily navigable by larger craft, it may be assumed as probable that the time will soon arrive when the iron of Korea will largely supply the ship-yards and machine shops of northern China. Silver is found in at least four localities; copper is worked in paying quantities in two; galena is widely distributed; and zinc-blende has been found near the capital. Sulphur is said to occur

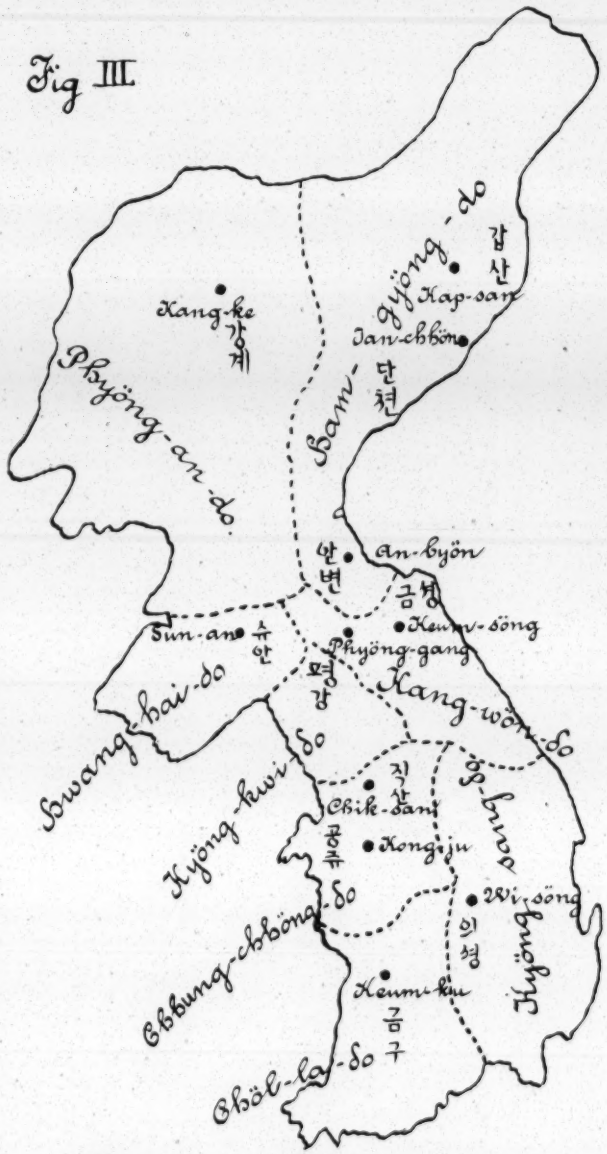
in Kyŏng-sang-do; no ore of mercury is known to the Koreans, who import their supplies of the metal and its preparations from China.

At the time of the opening of Korea by treaty, 1870–80, an impression seems to have prevailed quite generally that the country was extremely rich in gold, that great quantities of the precious metals were soon to be exported, or that mines of great richness would be found and worked. The years that have elapsed since this date have partly served to prove the fallacy of these assumptions, yet the doubt is not yet fully removed. Gold is now known to occur in many places in moderate quantities: in alluvial deposits, from which it may be washed by simple mechanical process, and in quartz veins, from which it is extracted in small quantities by crude and laborious methods of rock-pulverizing and washing. A small constant demand for the metal has always existed, for jewelry and gilding—the latter quite a common decorative process, which up to the present seems to have required the use of pure gold even for the crudest applications. The mines remain for the greater part unworked, however, for three reasons: (1) the native dislike for altering the geomantic conditions of any locality by digging holes in the ground; (2) the laws forbidding the search for the metal, for gold mining in Korea is a government monopoly; (3) the inability of the peasants to find a market for the gold that they surreptitiously work. There has always existed a chance of disposing of it by crossing the border into China, and there has probably long been a small steady export in this way; and a port has been opened near the capital where reside Chinese and Japanese merchants who must find a way of converting the Korean copper cash into some medium of exchange easily negotiable abroad, and who for this purpose have been known to purchase gold from the Koreans at a considerable premium. I have examined a number of specimens of Korean gold which had been brought to Che-mul-po and had passed into the hands of foreign merchants there. In several cases I found small pieces of quartz clinging to flat laminated grains of the metal of considerable size.

In answer to inquiries that I made from time to time during a residence of more than a year in Korea I was told by the Koreans of a number of localities where gold was supposed to be abundant. I have endeavored to show these collectively upon

a small map (Fig. III) giving the Korean names of the towns and districts with their English equivalents and the names of the provinces of the kingdom in which the places are situated. I was told repeatedly that the metal was most plentiful at Tan-chhön, in the Ham-kiung province. Concerning this locality our Korean geographer says, "at Ma-un, west of Tan-chhön, much gold is found. The mountains there are lofty and precipitous."

Fig III.



Sketch-Map of Korea

Localities where gold has been found are marked ●

THE ORDNANCE SURVEY OF GREAT BRITAIN—ITS HISTORY AND OBJECT.

By Josiah Pierce, Jr.

I. The Institution of National Surveys.

The earliest surveys were not laid down as maps but consisted of catalogues of property which are called "terriers;" of these the Domesday Book is the earliest extant. Had the art of surveying been properly understood at the time of the Norman conquest there would probably have been a Saxon cadastre along with the Domesday Book, which was ordered by William the Conquerer in the year 1085.

"After this had the king a very large meeting, and a very deep consultation with his council about this land, how it was occupied, and by what sort of men. Then sent he his men all over England, into each shire, commissioning them to find out 'how many hundreds of hides were in the shire; what land the king himself had, and what stock upon the land, or what dues he ought to have by the year from the shire.' Also he commissioned them to record in writing, 'How much land his archbishops had, and his diocesan bishops, and his abbots, and his earls; and though I may be prolix and tedious, what and how much each man had, who was the occupier of land in England, either in money or in stock, and how much money it was worth.' So very narrowly indeed did he commission them to trace it out, that there was not a single hide nor a yard of land (the fourth part of an acre), nay, moreover, (it is shameful to tell, though he thought it no shame to do it) not even an ox, a cow, or a swine was there left, that was not set down in his writ, and all the recorded particulars were afterwards brought to him."—*Saxon Chronicle, by Ingram.*

The publication of the Domesday Book was ordered first by George III. in 1767, and completed in 1783. After the discovery of the art of photozincography it was reproduced "in facsimile" in 1864–5, under the direction of Lieut.-Gen'l. Sir Henry James, then director of the Ordnance Survey.

Little change (in the art of mensuration or surveying) seems to have been made until the early part of the 17th century when simple boundary line maps accompanied the terriers of the surveys made in Ireland in 1634, by order of Lord Stafford, then viceroy. Great improvements were introduced about that time in Sweden by Gustavus Adolphus, which must have become known to Cromwell, for in 1654, the "Down Survey," as it was called, comprised maps of the townlands, and baronies over two-thirds of the surface of Ireland, that is, comprehending about 20,000,000 of English acres.

It may not be uninteresting or irrelevant to bestow a few remarks upon the development and methods of surveying in the seventeenth century, many of which have descended with little modification to the present day.

When man first conceived the idea of owning real property the art of geometry or surveying became a necessity. Interest in other worlds than our own, and the measurement of time, led to the development of the science of astronomy, and of graduated instruments for measuring angles. Many of the most refined modern instruments are but slight modifications of original Arabian models, and the practice of linear surveying, or the subdivision of land into triangles, and geometrical figures, whose area could be computed, has been carried on without modification for centuries.

The greatest development took place after the introduction of artillery in the methods and instruments used for trigonometrical surveying or range-finding. Every principle which is to-day known and applied in the construction and use of modern trigonometrical surveying instruments can be traced in a modified form to the construction and application of the instruments of the sixteenth and seventeenth centuries.

In the practice of artillery, the first important question is the distance or range of the enemy. As in war it was clearly impossible to obtain the same by direct linear measurement, instruments were devised for measuring the range trigonometrically, all based on the calculation of a single triangle, the base and two angles of which could be measured. These instruments were simply modified to the extent of furnishing in the instrument itself a constant base or angle so that only one or at most two measurements were necessary.

The one instrument that has received the greatest development in the modern type is the quadrant, a simple graduated arc from whose center was suspended a plumb-line, or which carried a movable arm with raised sights for measuring horizontal or inclined angles. This arm has retained the name alhidada derived from the Arabic.

Such was the trigonometrical instrument used by the earliest navigators and astronomers for determining latitudes, and by surveyors and artillerists for finding ranges.

In the latter part of the 16th century Thomas Digges, surveyor and author, conceived the idea of combining two such graduated arcs in one instrument, the one placed horizontally and the other in a vertical plane, the whole supported on a rigid stand or tripod, and he called the same his *Theodolitus*, which is said by DeMorgan to have been the origin of the name of the modern instrument.

In the earliest books in the practice of artillery and of surveying, the crescent of the dreaded Moor appears in the woodcuts illustrating range finding or trigonometrical surveying generally floating over the tower of some captured castle or town, which it is desired to bombard. This clearly demonstrated that the chief use of trigonometrical instruments was for military purposes.

Among the instruments of surveying of this period which became practically obsolete in England in the present century, but which is most widely used elsewhere, is the plane-table, unquestionably one of the earliest instruments invented for measuring or recording angles.

At the period 1570, when the Germans claim that it was invented by Pretorius, a professor of the University of Nuremburg, it was unquestionably in use in England, and it is mentioned by Thomas Digges, in his *Pantometria*, published in 1590, as a platting instrument for such as are ignorant of arithmetical calculations. On the relative merits of the theodolite and plane table authorities still differ.

Throughout Europe great activity in the development of the practical applications of geometry soon followed the exchange of ideas brought about by the introduction of printing.

Side by side with the important geographical discoveries of the age came the minor improvements in scientific instruments

which rendered national surveys and geodetic operations possible at a later period.

With trifling modifications the instruments devised by Durer, Newton, and Gallileo are in common use to-day.

Gradual improvements can be traced in the application of surveying to military and civil purposes, to mapping the campaigns of Louis XIV. and Marlborough, and laying down the forfeited estates in Ireland by William III., until in 1729 the first national survey on a large scale, for public and private purposes, was commenced in Savoy and Piedmont by Victor Amadie II., whereon nine years were occupied.

The method of large surveys obtained the name of Cadastre (Terrier map). It was suggested for France in 1763, but was only commenced in that country in 1793. The exact derivation and meaning of the French term "cadastre" are not free from dispute. Some authorities refer it to the verb "cadrer" to square or correspond with, all objects on a large scale, plan, or cadastre being shown in their true position and proportions, whereas in a mere topographical map similar accuracy is impossible, and certain features must need be exaggerated for the sake of distinctness.

The *Dictionaire des Dictionaires* on the other hand derives *cadastre* (formerly capdastre) from the mediæval-Latin word capitastrum (from caput "head," because formerly people were taxed, and afterwards property) and defines it as "a public register, containing the quantity and value of landed property, names of owners, etc., and which serves for the assessment of the tax on property in proportion to its revenue."

In the *Recueil des Lois et Instructions sur les contributions directes*, the *cadastre* is defined as "a plan from which the area of land may be computed, and from which its revenue may be valued."

This, there is no doubt, is the sense in which the word is used on the Continent, while in England it is taken as denoting generally a survey on a large scale.

It was not until long after the organization of the Ordnance Survey that it became a cadastral survey. Its organization at first was distinctly for military purposes, and the extension of its operations to cover all national needs only attained after years of discussion, and struggle for existence.

The credit of originating and carrying into execution the first tangible project for a systematic topographical survey of part of the kingdom is divided between two engineer officers, both at the time holding distinguished positions on the staff of the British army. The idea would seem to have followed close upon the sanguinary termination at Culloden of the "forty-five" rebellion, by which the fate of the house of Stuart was decided, in the reign of George the Second.

It was doubtless the outcome of that unhappy rising for it contemplated a general map of the Scottish highlands, precisely those parts of the country in which the heart and soul of the insurrectionary movement had all along centered. The difficulties of moving troops through these wild mountain districts, and without any clear knowledge of the passes connecting the glens and fastnesses, or of the correct distances intervening, would have been enormously lessened by the possession of good maps.

The survey of this wild and inaccessible region was undertaken in 1747 by Lieutenant-General Watson, an engineer, ably assisted by William Roy, who afterwards played a distinguished part in the earlier geodetic work of the Ordnance Survey.

The map, at first intended to be confined to the Highlands only, was at last extended to the Lowlands and thus made general in what related to the mainland of Scotland, the islands (except some lesser ones near the coast), not having been surveyed.

It is spoken of by Lieutenant-Colonel White, in his excellent book on the Ordnance Survey, as a "piece of work which appears to have been excellently carried out as far as it went, qualified by the remark of Roy that owing to the comparative inferiority of the instruments used and the inadequacy of the annual grants provided for the survey it is rather to be considered as a magnificent military sketch than a very accurate map of the country."

The survey of Scotland was interrupted by the breaking out in 1755 of another of England's intermittent wars with France, that which gained her Canada, and the work was never completed.

"On the conclusion of the peace of 1763," writes General Roy, "it came for the first time under the consideration of government to make a general survey of the whole island at the public cost." But, for reasons not assigned, the twelve years' interval of peace before the outbreak in 1775 of the American War of Independence was allowed to pass away without anything being done.

There the matter remained in abeyance until, after renewed hostilities with France and Spain, peace was negotiated in 1783.

The trigonometrical survey of Great Britain may be said to have been begun one hundred and six years ago.

Astronomers of that day were desirous that the difference of longitude between the Greenwich and Paris observatories should be ascertained by trigonometrical measurement; and under the auspices of the king and of the Royal Society, General Roy, R. E., in April, 1784, began the task by the measurement of a base line on Hounslow Heath which was to serve us the starting point of a series of triangles to be extended to Dover and across the channel.

This work was carried out, a connection with the French triangulation being established in 1786.

Soon after this the government decided on having a general survey made of the entire kingdom, on the scale of one inch to one mile for military purposes, and General Roy's triangulation in the southeastern counties became the basis of the Great Triangulation, which was gradually extended over the whole of the British Isles and finished in 1853.

The one-inch survey was carried northward through England and Wales under the successive superintendence of artillery and engineer officers, and by 1824 had reached the southern borders of Yorkshire and Lincolnshire.

At this time it became necessary that a survey of Ireland should be made on a large scale as a basis for general land valuation. On the recommendation of Colonel Colby, then director, the scale of six inches to one mile was agreed upon; the work in England was suspended and the force transferred to Ireland.

It appears from a report of Colonel Colby, in 1840, that the purposes for which the English and Irish surveys were designed were gradually developed and not all originally known.

The principal triangulation, on which the survey of South Britain had been based, was partly designed for astronomical purposes, and partly for a map on small scale.

The detail plans were commenced by officers of the Royal Engineers, partly for the purpose of practicing them in military drawing, and partly for the purpose of making plans for the use of the Ordnance.

The publication of some parts of this map on the scale of one inch to one mile created a desire among the public to possess better maps than had formerly existed.

This led to the employment of civilian surveyors to advance the progress of the map, and it was found necessary at great additional expense, to revise and correct these contract plans.

The work did not possess the accuracy demanded by the admiralty in forming the basis of their coast surveys for the Geological Survey or the civil engineers. As a military map its publication during war was suspended, and its continuance became a matter of doubt in time of peace.

At one time the gentlemen of Lincolnshire and Rutlandshire proposed to the government to proceed with the map of their district out of its regular turn, upon condition of their becoming subscribers for a certain number of copies. These gentlemen partly wished for the map for their use in hunting, and partly for the improvement of the country in marking out the drainage of the fens.

Prejudices existed, which could be traced back to the Norman conquest and Domesday Survey—against the right of a surveyor to enter a private estate, and in the early contract plans for the English maps the surveyors neglected the survey of the lesser streams, to obviate the inconvenience of trespassing and to save themselves trouble.

These were some of the causes of delay, expense and insufficiency which had operated against the earlier surveys.

The survey of Ireland began in 1825 under far more favorable circumstances than the Ordnance map of England and Wales. The triangulation commenced from a more accurate baseline than any preceding triangulation, and was designed to serve as a basis for any future survey in any scale, however large.

The House of Commons passed an act defining its principal object, prescribing a legal mode for ascertaining the boundaries which were to be surveyed, granting the surveyors power to enter lands for the purposes of the survey, and preventing the removal of the objects used.

The earlier methods of military surveying were abandoned, and new instruments and a system were devised for its execution.

It is important to note that the organization of the Irish survey marked an important epoch in the history of the Ordnance Survey, viz: its change from a topographic to a cadastral survey.

In Ireland, subordinate to the parishes, there is an internal division of smaller denomination called townlands, which are very frequently, but not uniformly, conterminous with property.

XUM

The townland was the lowest unit of taxation for country purposes, of an average size of 200 or 300 acres, and originally the map was to be simply a topographic map, containing the boundaries of the townlands, the roads, the streams and the houses, with a view to the valuation of Ireland for the county assessment. The six inch was considered to be the smallest scale that could be available for that purpose.

There was no intention in the original Irish survey to insert the fields, but when the valuation began, it was found by the valuators that additional minuteness was necessary to enable them to subdivide the townlands into the qualities of lands of which they consisted, and more especially that the boundary between the cultivated and uncultivated portions ought to be inserted on the maps with great accuracy.

This rendered necessary a very extensive revision which was undertaken in 1830, and it became a survey by fields instead of townlands.

This was clearly a wide and most important departure from the original intention of the six inch survey in Ireland, and it is not to be doubted that General Colby, who would not trust to paper measurements for the areas of entire townlands, would have adopted at the very outset, for his manuscript plans of these minute subdivisions, a scale much larger than that of six inches to one mile.

The engraving of the six inch survey appears to have resulted from a demand for six copies of one sheet for valuation purposes when it was found that it would be as cheap to engrave it as to make that number of copies.

So valuable did the six inch map of Ireland prove for many purposes over and above that for which it had been originally designed, that, in 1840, when the Irish survey was completed, and that of England resumed, the Government gave their consent to the adoption of the same scale for the unsurveyed parts of Great Britain.

By 1851, Yorkshire, Lancashire, the Isle of Lewis, and several counties in the south of Scotland were finished on the six inch scale.

Then began that long controversy which has been well termed the "battle of the scales" and which for eleven or twelve years retarded the progress of the survey and led to a large waste of public money.

During the time that the Ordnance Surveyors were engaged in making their six inch map of Lancashire and Yorkshire they were called upon and employed to make, at the expense of the land owners, twenty-three plans of parishes and townships on the scale of twenty-six and $\frac{2}{3}$ inches to one mile for tithe commutation.

It was even found that the plan of London, made for the Metropolitan Commissioners of Sewers, on the scale of sixty inches or five feet to one mile was inapplicable to house drainage within the area.

Between 1851 and 1852 no fewer than three select committees and one royal commission deliberated on the scale for the survey, and fourteen blue books were presented to Parliament.

The main point of the controversy was whether the six inch or some larger scale was best fitted for the national map. A host of persons eminent in science were consulted on the subject, and a great diversity of opinion was found to exist, the weight of evidence, however, inclining by a majority of four to one, to a scale of from 20 to $26\frac{2}{3}$ inches to a mile.

In 1853 a statistical conference held at Brussels and attended by twenty-six delegates from the chief States of Europe considered the question of national maps or cadastres, and pronounced unanimously in favor of a scale of $\frac{1}{2500}$th of nature equivalent to about $25\frac{1}{3}$ inches to a mile, recommending at the same time that the cadastre on this scale should be accompanied by a more general map on the scale of $\frac{1}{10,000}$ equivalent to about six $\frac{1}{3}$ inches to a mile, and thus very nearly corresponding to the six inch scale of the Ordnance Survey.

The scale finally adopted of $\frac{1}{2500}$, on which the whole of England has at last been surveyed, is one which corresponds with that adopted for the national maps and plans of the chief countries for Europe. Lastly it possessed the incidental advantage that a square acre is to all practical intents represented on the plans by a square inch.

Among the many public purposes which the national map was expected to subserve are the following: the valuation of property for the equitable adjustment of taxation and assessment; the sale and transfer of land and the registration of title; railway and other civil engineering work, such as the construction of roads aad canals, large sanitary and drainage schemes, military engineering works, hydrographical, geological and mineral surveys; the

reclamation and improvement of waste lands, and of land from the sea; transactions affecting land as between landlord and tenant; statistical surveys, the setting out and adjustment of parochial and other public boundaries and so forth.

It has been amply proved on the best evidence that a map, with levels, on a scale of something like twenty-five inches to one mile is the smallest which can properly fulfill all these requirements.

In the organization and equipment of the Ordnance Survey, as it exists to-day, no pains are spared to secure the utmost precision and economy in its methods of field work and publication.

After more than a century of development and the completion of the cadastral map, let it not be supposed that its mission is at an end, for it is proposed to make a complete revision of all the cadastral work at least once every twenty years.

This is rendered necessary by the constant changes in property boundaries, and the growth of population—which may be gathered from the fact that the city of London increases in population at the rate of about 50,000 a year, and that eighty or more miles of new streets are added in the same time.

II.

The Ordnance Survey of Great Britain as it exists to-day is a remarkable Publishing Bureau, from whose presses are given the most elaborate and accurate series of maps which any country possesses.

Maps not alone confined to the representation of the physical features of the country, but containing every detail of interest or value for civil or military purposes.

It has justly gained the commendation of the French that it is "a work without precedent, and should be taken as a model by all civilized nations."

The principal scales of publication adopted by the Ordnance Survey are: (1) A general map on the scale of one mile to one inch. (2) County plans on the scale of six inches to one mile. (3) Cadastral or Parish plans for the whole country on the scale of $\frac{1}{2500}$ or about $25\frac{1}{3}$ inches to one mile, on which one square inch on the plan represents an area of one acre. (4) For towns of over 4000 inhabitants a scale of $\frac{1}{500}$ of actual length on the ground or $10\frac{56}{00}$ feet to one mile.

On the latter scale the city of London with its environs could not be well shown on a sheet of paper less than 300 feet long by 200 wide.

When the facts are taken into consideration, that the Ordnance Survey is a cadastral one, in other words, that one of its many objects is the measurement and definition of all existing boundaries, political, municipal, parochial or private, and a survey and valuation of property for assessments, that its maps are accepted in courts of law as authoritative on such questions, then the problem of the scales of publication is the most important one to be considered.

As an illustration of the relation of the scale of a map to the amount of detail, which can well be represented on it without confusion, assume for a moment that an observer is stationed in a balloon, which can be raised or lowered or placed at any desired height above the ground, and in addition that he is provided with a horizontal screen on which he is able to trace the details of the landscape below. The eye of the observer well represents the lens of a camera, and the screen the focussing plate. Therefore to produce a perfect image or map of the ground below it will be necessary to assume that all parts are stationary, balloon, plate and eye. For convenience assume that the eye remains over the centre of the screen at a distance of two feet. At a height of four miles above the ground the scale of the image on the screen would be exactly six inches to one mile, or a reproduction of the popular county map, on which every detail of importance such as houses, roads, paths, and fences is shown, and the smallest scale on which any attempt is made to preserve the relative proportions of such details.

On such a scale the 1/100th part of an inch represents a distance of very nearly nine feet on the ground and consequently however accurate the map might be in its projection, as an image showing the relative positions of all objects of importance on the ground, the scale is clearly too small for the measurement of areas for valuation purposes, and it is but a reproduction of the larger cadastral map.

Again assume that the balloon is stationed at a height of twenty-four miles above the ground, and that the observer places his eye at the same distance of two feet above the screen and attempts to construct a map from the image on the screen, which is now reproduced at a scale of one mile to one inch, or

the exact scale of the general map. It needs but little imagination to foretell that houses would be mere specks, roads, faint lines, and forests, masses of color, in other words, that it would be more instructive to consult the general map, on which all details are magnified to be clearly visible and topographic features brought out with great distinctness than to attempt to trace with unaided eye, from the image of objects at a distance of twenty-four miles, the course of streams or roads through forest or moor, or to judge of the relative elevations or modeling of the ground from the values of light and shade. Without an intimate local knowledge of the county there would be nothing to indicate the name or boundaries of villages, or estates or the political and other subdivisions of the land, which are most clearly indicated on the map, in unmistakable styles of lettering.

Another and more serious problem which would be lessened as the balloon receded from the earth would be the distortion in perspective produced by the irregularities of the surface. The higher points being nearer the balloon would appear in the image on larger scale than the lower, and only in the case of a perfectly level country, would it be possible to produce a map without distortion by the method proposed, and then only for a limited area.

As the balloon receded, the relative differences of elevation would bear a smaller and smaller proportion or ratio to the distance, in other words, the distortion would grow less until at an infinite distance it might be neglected.

We might conceive that the observer was stationed at an infinitely great distance, and provided with a series of magnifying lenses of suitable powers to produce maps of any desired scale, yet, beyond a limited area, he would still be confronted with the problem of eliminating the distortion produced by the curvature of the earth.

Such is the conception of an accurate map which is an attempt to produce on a plain surface or sheet of paper, a horizontal projection of objects on the ground, which will show the relative positions of every detail on any desired scale with as little distortion as possible, and on which distances may be measured in any direction, and areas computed with a degree of accuracy only limited by the scale.

When a survey of a small area is made, such as an estate or parish, which bears but a small proportion in area to the surface

of the earth, curvature is neglected, distortion due to this cause being imperceptible, but in the survey of a large country it is of primary importance.

Returning to the conception of an observer stationed at an infinite distance his position with refer nce to the new general one-inch map of England and Wales would be in the plane of a meridian passing through Delamere in Cheshire, and the published quarter sheets would be a series of rectangles each 18 miles by 12 miles, containing an area of 216 square miles whose edges were parallel to, and at right angles to the central meridian.

Those of Scotland and Ireland have for each country a central meridian and projection.

In viewing the county maps of six inches to one mile and larger scales, it would be necessary to assume that the observer was stationed over the center of each county except that, where two or three counties lie so well north and south of one another, the same meridian serves for more than one.

In the reproduction by photography of the maps on the scale of one mile to one inch from those of larger scale, these facts, that different planes of projection are used for the latter, have to be taken into consideration.

In countries of larger areas than England it is more customary to assume a central meridian for each sheet, in other words, the observer would be stationed in the zenith of the center of each sheet and would sketch but a limited area. The successive planes of projection, represented by the maps, would resemble the facets of a diamond, and it would be impossible to combine with any degree of precision a large number together in one plane surface. On the other hand, the whole of the one-inch series of England and Wales of Scotland or Ireland register perfectly, and the distortion due to curvature cannot be great, as the combined area of the three countries bears but a small ratio to the whole surface of the globe.

Attention has been called to the fact that viewed from a balloon in ordinary sunlight the minor features of topography become flattened and indistinct.

If, therefore, we regard a sheet of the one-inch map held at a distance of two feet from the eye as the picture of a country seen at the distance of twenty-four miles, we see that details, that would be invisible from above, are brought out with great distinctness on the map and every detail of topography is shown

in bold relief. In other words the map is a diagram rather than a picture.

In the representation of relief on the one inch series, two systems are common, contours and hachures. Contours represent the successive shore lines which water at rest would form in following the modelling of the ground at successive stages or elevations. If now we assume that the water, having reached the highest point, is allowed to retreat steadily to sea level the paths which the particles of water would take from all points of the surface are those which the engraver would endeavor to reproduce in the shade lines of a hachured map. In addition he would adopt an arbitrary scale of shade increasing with the steepness of the slopes, from white on a horizontal surface to dead black on slopes of forty-five degrees, or greater, to produce the effect of a model of the surface illuminated from above.

In the Irish maps this effect is bolder and more artistic, an illumination from the northeast quarter having been carried out. The shade lines still preserve the paths of particles of water in motion on the surface, the color values being deeper on the eastern and southern slopes, shadows have even been projected across valleys and horizontal surfaces are in half tone, producing much the same effect as the illumination of the country at sunset in midsummer.

The Irish maps exhibited are considered the finest specimens of careful hill shading and will bear critical examination. For comparison with these, other topographic maps are exhibited of many scales and countries.

So far attention has simply been drawn to a few of the problems of map-making, which are, briefly :

1st. The reproduction on a finite scale on a plain surface, of the natural features of the terrain, with all the artificial boundaries and objects added by man, so far as the scale permits.

2d. The extension of such a series of maps to cover a large area of country still carried out with as little distortion as possible.

3d. The reproduction of such maps on suitable scales to meet all demands.

If the conception is still carried out that the map, at a distance of two feet, is but the image of the ground viewed from above, then the cadastral map of England, from which areas of fields and estates are measured for valuation purposes, would represent

a view of the country from above at a range of 5,000 feet or nearly one mile, and a town plan, an image at 1,000 feet or a possible view from a series of Eiffel towers.

This suggestion of an observer stationed in a balloon will not have been valueless if it draws attention to the fact that vastly more information is given on the map than it would be possible for any single observer to discover from an elevated station with an unobstructed view, the map being the compilation of the results of hundreds of observations by many workers, and that its scale and the amount and character of the detail shown have been specially designed to meet definite ends.

It is beyond the limits of the paper to enter into the theory or practice of surveying, or to say more than a few words of the delicate and refined operations necessary in carrying out the geodetic or trigonometrical work of a national survey which binds together the many parts to make a complete whole.

The principal triangulation of the British Isles was begun in 1784 and finished in 1852. Two magnificent 3-feet theodolites made by Ramsden, one for the Royal Society, the other for the Master General of the Ordnance, an 18-inch theodolite also by Ramsden, and 2-feet theodolite by Troughton and Simms were used in these observations.

In the principal triangulation of Great Britain and Ireland there are 218 stations, at 16 of which there are no observations, the number of observed bearings is 1554—and the number of equations of condition, 920.

In order to avoid the solution of this enormous number of equations, containing 920 unknown quantities, the network covering the kingdom was divided into a number of blocks, each presenting a not unmanageable number of equations of condition. These calculations, all in duplicate, were completed in two years and a half, an average of eight computers being employed. Many of the sides of the principal or primary triangulation are of great length, 66 of them exceeding 80 miles, while 11 measure more than 100 miles, the longest being 111 miles, that from Sea Fell to Sheir Donard. So great, however, had been the accuracy of the observers' work, that the average amount of correction of the observed angles was no more than $0''.6$, and the measured length of the Salisbury base differed from its length as computed from the Irish Base, 350 miles distant, by a difference of only five inches.

The secondary triangulation interpolates points at shorter distances apart ranging down to five miles, the observations being made with theodolites of 12-inch circle. These triangles again are broken up into smaller ones of sides from one to two miles in length, for the use of the surveyor who is to follow and measure between the stations with the chain ; and a further subdivision of the trigonal spaces is made in towns to points about 10 chains apart, where the survey is to be made on the very large special scale. In the two last cases, 7 inch instruments suffice for the measurement of the angles.

Levelling.

From 1839 to 1855, lines of initial levelling extending all over England, Scotland and Ireland were run, and the observed altitudes of the bench marks were reduced by the method of least squares.

In England and Scotland, these levels are based on the Ordnance Datum at Liverpool, which is approximately the mean tide level of that place ; in Ireland, they are based on the low water level at Dublin, which is about 8 feet below the mean level round the coast of Ireland.

The detail levelling is carried out contemporaneously with the progress of the cadastral survey. Starting from the marks on the initial series, lines are run along nearly all the turnpikes and parish roads, and bench marks cut at intervals of about a quarter of a mile.

The whole of the bench marks of the initial levelling are shown in position on the 25-inch manuscript plans, and their heights given to the nearest tenth of a foot. Surface heights, to the nearest foot are also marked on the plans, at frequent intervals between the bench marks.

Contouring.

Contrary to the custom in other countries, the contours of the English survey have all been surveyed and levelled on the ground, checked by the numerous bench marks, the standard of accuracy demanded in levelling being two-tenths of a foot.

Owing to the expense of the process, about $1.25 per lineal mile, only the 100 foot contours have been surveyed, except where greater detail is required for military purposes, which information is not furnished to the public.

Hill Shading.

The hill features for the one inch maps are first sketched in the field by the military method of slopes and sketch contours or proof impressions of the contoured sheet.

Finished drawings from the field sketches are then made on cardboard impressions from the one inch outline plates, and finished as guides for the engraver to work by.

Beautiful and delicate in finish as is all the work of the copper-plate engravers on the Ordnance Survey, there is perhaps no branch in which they so peculiarly excel as in their delineation of hills on the one inch maps.

III.

It is impossible in the limits of a single paper to attempt to describe the methods and processes of publication which are carried at the headquarters of the Ordnance Survey at Southampton.

Carefully prepared treatises on the subject have been written by officers engaged in the work, and for clear and concise description none are better than the series of articles by Captain H. Sankey, R. E., published in *Engineering*, in 1888.

There are two points of great interest in connection with the Ordnance Survey which cannot be neglected. The one its military organization, and the other the economy of its methods of publication.

Of its military organization, which has continued since the first surveys were made for military purposes, it may be said that the conservative precision of its methods of field work are best adapted for military control and discipline. Under the successive superintendence of highly educated officers of the Royal Engineer Corps, whose patriotic efforts have been to secure efficiency and economy in the service, the country has greatly profited.

Many of the improvements and inventions that have made possible the publication of maps of all scales at the lowest possible cost, are the results of experiments made by these officers.

It should not be forgotten in addition that as a branch of the War Office and the Publishing Department of the Intelligence Branch, military supervision is essential. Its offices are therefore not open for public inspection except on proper introduction.

The author had the rare privilege of spending three months at the Southampton office in 1888, through the introduction of the director of the Geological Survey, and the request of our recent minister in London, Mr. Phelps.

Nothing could have exceeded the courtesy and hospitality of the director of the survey, Sir Charles W. Wilson, and the officers in charge of the various departments, not alone in granting the necessary authority to inspect every branch of the work, but in lending personal aid and men for that purpose.

Great interest was also expressed in the topographic surveys of this country which differ so essentially from the Ordnance Survey. In the former, field work and methods are directly adapted to the scale of publication; in the latter, the largest scale of publication governs the operations of the survey, and the smaller scales are reduced by photography, with a gradual elimination of unnecessary details from the larger to the smaller scales until finally the topographic map of the country, on the scale of one mile to one inch is produced, which possesses an accuracy and character that could be obtained by no other method.

To illustrate this important subject there are exhibited a series of experimental and complete maps and diagrams which will well repay careful examination. They were prepared and collected at the Ordnance Survey at Southampton expressly for this purpose and with the kind permission of the present director, Colonel Sir Charles W. Wilson, R. E., C. B.

The author desires to state that many of the paragraphs of the paper, particularly those relating to the history of the Ordnance Survey, have been extracted from the following works and reports on the subject:

1. The Ordnance Survey of the United Kingdom, by Lieut.-Col. P. Pinkerton White, R.E.

2. The Ordnance Survey of the Kingdom, by Capt. H. S. Palmer, R.E.

3. Methods and processes adopted for the production of the maps of the Ordnance Survey, by Lieut.-Genl. Sir Henry James, R.E., F.R.S.

4. Reports of Col. Colby and others in the Blue Books presented to Parliament—1850–1860.

GEOGRAPHIC NOMENCLATURE.

REMARKS BY HERBERT G. OGDEN, GUSTAVE HERRLE, MARCUS BAKER, AND A. H. THOMPSON.

MR. OGDEN: It was expected that Professor Mendenhall would be with us this evening to address the society on the subject of Geographic Nomenclature but he is unavoidably absent, having been called to Philadelphia, and has requested me to represent him, and present to you an apology for his absence.

Professor Mendenhall has been greatly interested in this question since he assumed charge of the Coast and Geodetic Survey. Questions of orthography and nomenclature have been before him almost constantly, and the variety of views elicited in response to his inquiries confirmed him in the opinion that the subject is of serious import. He has had, of necessity, to decide a great many cases for publications which were being made: finally a long list relating to Alaska came from the Hydrographic office, which led to a discussion and the suggestion that a board should be formed consisting of representatives from the different departments and bureaus in Washington that were interested in this matter, and that were issuing maps, charts and other publications requiring geographic names. It is too true that the different bureaus are now using the same names spelled in different ways, sometimes different names for the same place, and the same name for different places; indeed, the confusion is so great you may even read publications relating to the same locality and at first not realize the fact.

The object that Professor Mendenhall had in view in organizing a board was to secure harmony; that all might come together; and that when a question arose between different bureaus it might be referred to this board to settle, with the concurrence of all. Such a board would also secure stability, as no bureau would undertake to make changes in names that have been accepted, as may now be the case when a bureau falls under new management, or the determination of the questions is referred to new officers without experience. This board, as proposed, was to be formed by representatives from the Hydrographic Office, Smithsonian Institution, War Department, Geological Survey, Coast and Geodetic Survey, Light-house Board, The National Geographic Society, Post Office Department, and the General

Land Office. All these bureaus or departments gave their assent except the Post Office Department and the General Land Office; but we may hope that these departments will eventually be represented, when the practical usefulness of the board has been demonstrated by its decisions.

There are three, perhaps four classes of cases that cause the most trouble in geographic names. In the first class, those cases where we are certain of the name itself—that is, we agree in the pronunciation, but disagree in the orthography; in the second class, where there is no question as to the orthography, but where there is a question as to what name should be used—that is, several names are given to the same point, to the same body of water, or to the same island; in the third class, where there is no question as to the name or the orthography, but a question as to the place to which the name applies—that is, there is no dispute as to the name, but it is applied to different places; this class is sometimes modified by questions as to the geographical limits to which a name applies—that is to say, the area to be indicated by the name; for instance, some body of water or a range of mountains, and may be designated a fourth class.

To cite a few instances of these classes: we have the question of Wood's "Hole" and Wood's "Holl;" for many years it was called Wood's Hole, recently it would seem to be the conclusion that it should be called Wood's Holl; we formerly had "Hurl" Gate, and now "Hell" Gate; "Princess" Bay was at one time spelled "Prince's" Bay, the error arising, doubtless, from the pronunciation; we also have "Body's" Island or "Bodies" Island; we have a peculiar case on the North Carolina coast, "Pamplico" Sound has generally been used, now we have "Pamlico" Sound, legalized by the State legislature; on the coast of Virginia we have the case of "Metomkin," which has frequently been written "Metompkin" and "Matomkin;" in California we have Point Conception, whether it should be spelled with the "c," or with the "t," in the last syllable; we also have "Point Boneta" or "Bonita;" should Yaquina be spelled with one "n" or two ("nn"); Coos Bay, with "k" or "c." This name, I understand, is sometimes pronounced "Co-os," as though it had two syllables; if the spelling of this name was governed by the rules of the Royal Geographical Society the "K" would be used for the hard "C," but "Coos" has been adopted by the State legislature and will probably be retained.

One of the most singular perversions is found in "Bering Sea;" the explorer wrote his name "Bering," and yet we find it is customary, almost everywhere, to spell it "Behring."

In the second class of cases, where we have different names for the same place, we may cite Bangs Island, at the entrance to Portland harbor; an effort was made not long ago to change this name on the Coast Survey charts to Cushing's Island, the evidence was so strong that an order was issued to effect the change, when the supporters of "Bangs" produced additional evidence and secured the retention of that name. On the coast of Florida we had two Saint Joseph's Bays, and a comparatively modern name, "Anclote Anchorage," was presented to take the place of a part of one of them, which led to designating the rest of the bay "Saint Joseph's Sound," Sound being more appropriate for the locality. We have also some notable instances on the Pacific coast, as "Cape Orford" or "Blanco;" "Cape Gregory" or "Arago;" "South Farallon" or "Southeast Farallon;" and in Alaska there are instances too numerous to mention.

In the third class of cases, the locality to which the name applies, we may cite "Isle-au-Haut" Bay and "East Penobscot" Bay, on the coast of Maine; "Hempstead" Bay, on the coast of Long Island, a bay which is almost filled with small islands, rendering it most difficult to satisfactorily define the limits; "Chincoteague" Bay, on the Jersey coast, is an instance of growth; it was at one time called "Assateague," and although "Assateague" was retained for many years as applicable to the upper part of the bay, it has finally been restricted to a very small cove in Assateague Island. On the Pacific coast there are a great many instances, possibly one of the most difficult relates to the limits of Admiralty Inlet, how far it extends into Puget sound? Again, to the northward, is what for years has been called "Washington" Sound, an effort is being made to change it to "Possession" Sound, the latter name, I believe, was once applied to a portion of the area; perhaps we shall eventually see both names on the chart. The difficulty of defining the limits to which a name applies may be experienced in dealing with "Hampton Roads," or "Tybee Roads;" apparently simple problems, but who will undertake to define the exact limits of these famous roadsteads?

These questions, even when stated in their simplest form, are oftentimes very complex, for several of the general classes I have

referred to may be included in one question, and when we attempt to determine that which is best they become very perplexing. In seeking advice we are met with a variety of views ; some will maintain that we should take the nick-names given by the fishermen ; some prefer names that have been recognized independent of nick-names ; some will abhor corruptions, while others prefer the corruptions, if expressive and in general use. The experts are very prone to hunting up the root, or, if necessary, to constructing one, and throwing out everything that will not conform with it. The fact that our country was settled by French, Spanish, and English, and that many names are derived from the Indian dialects, also causes peculiar difficulties in treating some sections. The rules of the Royal Geographical Society can be a great help, so far as they are applicable ; they seem to have been used in the modern spelling of "Dakota"—for the man-of-war we had of this name some years ago, it was spelled "Dacotah," but in the name of the States recently admitted to the Union, "k" has been substituted for the hard "c" and the final "h" has been dropped. There is also great disagreement as to the propriety of the use of the possessive case ; some will not admit it at all, others would like to drop the apostrophe and retain the "s" in certain cases for euphony: this is a question that requires special consideration in each case, as the omission of the possessive will sometime give the name a descriptive meaning not at all applicable to the locality or feature. The propriety of personal names is also questioned by many, and may lead to continued discussion in Alaskan nomenclature, where explorers and surveyors have been so liberal in bestowing new names on the same places. It would seem to be a good rule in selecting a new name to follow the old Indian custom of describing the place. An opportunity for an expressive nomenclature seems to have been lost in the north-west in transferring so many of our eastern names, instead of selecting new names from the rich native vocabularies.

As different bureaus may be governed by different principles, and may not even be consistent in their own rulings, through new principles that may come in by the frequent change of personnel, it has heretofore been impracticable to secure uniformity, and disputed questions have been carried along for years. The board that has been organized is in the direction of developing uniformity in the practice of all. It is no easy task, but if guided by a generous spirit, willing to yield a little here and there, its object may be successfully accomplished.

We cannot foresee to what extent the board will be called upon. It has not power to take the initiative; but we hope its rulings will prove acceptable; that it may establish a reputation that will be recognized by the people as well as by the departments interested in its organization; and that eventually rules may be recommended for the nomenclature of our own country that may be an acceptable guide in the determination of new names, as well as in the interpretation of those now in question.

MR. HERRLE: Any one conversant with the state of geographic nomenclature of a large part of the world cannot fail to appreciate the difficulties in the way of the establishment of a comprehensive and uniform system of writing geographic names, that would be acceptable to all nations using the Roman alphabet in their literature. But while some advance towards international uniformity has been made within the last five years, we are still very far from it; we may, however, at least rejoice in the prospect of the general acceptance of a uniform system in geographic orthography by all writing the English language.

I refer to the action of the British Hydrographic Office and of the Royal Geographical Society in 1885, when they adopted certain *main* principles to guide the orthography of geographic names, and thereby took an important and far-reaching step in the line of a reform which had already been too long delayed.

In France a reform in geographic nomenclature had been earnestly agitated by Édouard de Luze since 1880, and soon after the publication of the system adopted by the Royal Geographical Society, the Société de Géographie appointed a commission which, in 1886, reported a system for the guidance of French geographers.

In Germany, we also find individual attempts made (Egli, Kirchhoff, Ewald and others) to bring system into the orthography and pronunciation of geographic names, primarily with a view to secure uniformity in text books and in the teaching of geography in schools.

No doubt influenced by the action of the British and French geographic societies the Imperial German Hydrographic office in 1888 also established rules for guidance in its future publications.

We thus see three of the principal nations of Europe inaugurate a reform, the beneficial effects of which will not, however, become apparent until a sufficient time has elapsed, that is, until

the British, French and Germans have had time to apply the rules in their publications, and particularly in the construction of new and in the correction of old charts. No reform of this nature can be carried through by the stroke of a pen, but a generation's life-time will be required to accomplish it.

The adopted rules which lay down a general phonetic principle only require, of course, perfection in details, so as to furnish an unerring guide in the treatment of names belonging to special languages.

If we compare the British, French and German systems, we can clearly see a gravitation towards uniformity in the spelling of foreign geographic names that are not originally written in the Roman alphabet. Each of the three systems contains important concessions to the others; the British, by adopting the continental vowel system, and the French and German, by representing certain phonetic values differently from the old way, so as to approach the British system. In the French system, this is particularly the case in regard to the letters *ou*, *c*, *ch*, *g*, *q*, *th*, *tch*, *w* and *y*, and in the German system in regard to the letters *c*, *j*, *q*, *ch*, *sh* and *y*.

There is very little doubt that English and French geographers will readily adopt the systems set up by their foremost geographic societies; but whether scientific Germany will be willing to follow in the wake of its Hydrographic Office, we will probably learn after the next meeting of the German Geographic Congress.

If we compare the British, French and German systems further, we find also a perfect agreement in the treatment of the geographic names of those nations that use the Roman alphabet in their literature, they differing only as to exceptions from the rules of old forms of names, which, through long usage, are held almost sacred. The spirit of conservatism tends to retard every reform, and this one makes no exception from the rule. It is, however, to be regretted that neither the British, nor the French, nor the Germans have set any fixed limit to permissible exceptions, leaving, apparently, everybody to decide for himself what is meant by "long usage."

If a radical departure from past usage is perhaps too objectionable to many, this much could be done at present to greatly reduce the list of exceptions, leaving it to the future to smooth over the remaining cases: let all names which are now written but slightly different from their national form and which are easily recognized in the latter form, be corrected, and extirpate all gross

corruptions. Also lessen the number of exceptions in those foreign names which are readily understood when written in accordance with the adopted phonetic rules : as Kalkutta for Calcutta, Mekka for Mecca, Kutch for Cutch, Selebes for Celebes, Bonni for Bonny, etc.

Another notable agreement in the British, French and German Hydrographic Office systems is found in their declarations in regard to diacritical marks in the writing of foreign geographic names. The British say that a system which would attempt to represent the more delicate inflections of sound and accent would become so complicated as to defeat itself. They therefore recommend only the use of the acute accent to denote the syllable on which stress should be laid. The German Hydrographic Office has adopted the same view. The French Commission in its deliberations expressed decided opposition to the adoption of Lepsius' or any similar system, and finally adopted besides the "*tilde*" and "*créma*," only the accent "*circonflex*" and the "*apostrophe*," signs of which the two last are ordinarily employed in the writing of the French language. "In our country," the French commission says, "a native of the Normandy and one of the Provence do not employ exactly the same sounds in pronouncing, for instance, Marseille, Enghien, or Montrichard, and, in foreign lands, we find still greater diversity in this respect." Therefore, we should use diacritical marks with the greatest economy, and only when they are indispensable.

It is of course not to be expected that a certain school of geographers, who are in favor of the strict application to geographic names of a simplified form of Lepsius' standard alphabet, will acquiesce in this view, but it is to be hoped that all practical minded geographers will agree to reserve the extended use of diacritical alphabets for purely linguistic literature only.

In the meanwhile, the United States has not been idle, and the Hydrographer, Captain Henry F. Picking, U. S. N., has taken the initiative by the appointment of a board to consider and report a system of orthography for foreign geographic names for guidance in the compilation of the Hydrographic Office charts, sailing directions and notices to mariners, which as we know cover all parts of the world.

The Hydrographic Office, by its daily experience with the subject matter, is thus peculiarly fitted to inaugurate a reform, and it is hoped that the board, profiting by what the British, French

and Germans have already done, will report rules, that may become generally satisfactory to American geographers.

In our own country the territory of Alaska needs special attention in regard to settling the orthography of its geographic names of Russian origin. Russian names have always been more or less of a bugbear in geographic literature, since so great a number of them appear in different forms. The difficulties of transcribing Russian names so as to reproduce the correct pronunciation are well enough understood. In the first place the Russian alphabet contains 36 letters, of which 12 are vowels and diphthongs, 3 are semi-vowels, and the balance, consonants. In this alphabet, there are 12 elements which have no exact equivalents in the English alphabet, and, on the other hand, there are 4 English sounds (*j*, *w*, *x* and *h*) not represented in the Russian alphabet. Hence, whatever system is employed, we can only hope to give the pronunciation approximately. Many of the Russian names found to-day in English and American maps and publications show, by the way in which they are rendered, an utter absence of knowledge of the grammatical construction of Russian on the part of those who originally transcribed them. There are few other languages in which case and gender play such an important part in the terminal inflections of proper names as in this great Slavonic idiom. Any one not conversant with the Russian declensions should not, therefore, attempt to transcribe Russian geographic names into English, as he will be sure to blunder. On Russian maps, for instance ; Behring Strait reads, "Beringov Proliv ;" Behring Sea, "Beringovo More ;" Kamchatka Bay, "Zaliv Kamchatkii;" Herald Island, "Ostrova Gheralda;" etc.

By the by, I cannot exactly understand why the spelling of the name of *Behring* should, within the last few years, have been changed on American and English maps to *Bering*. The navigator of this name, *Veit Behring*, was a native of Germany, in the service of Russia, and it is safe to say that his name contained the letter *h*. Naturally, in transcribing his name into Russian, the *h* had to drop out, as that letter is missing in the Russian alphabet.

The excellent system of transcribing Russian names into English, published in a recent number of *Nature*,* having already been accepted by English and American representatives of various scientific institutions, it is greatly to be desired that English and

* February 27, 1890.

American geographic societies should express their views of it at an early day. The system is easily brought in harmony with the general principles adopted by the Royal Geographical Society, by a simple declaration in regard to the diacritical marks by which, mainly for the purpose of facilitating correct re-transliteration of Russian names, the vowels *i*, *ī*, *ĭ*, *e* and *é* and the silent semi-vowels are sought to be distinguished in the written names. For the benefit of those unacquainted with the system of transliterating Russian, published in *Nature*, it is reprinted at the close of this paper.

A few words more in regard to the treatment of the Russian geographic names found in Alaska. This territory will in the course of time contain a large English-speaking population, and its geographic names of Russian and Eskimo origin should, in a certain sense, no longer be classed by us under the category of foreign names.

The future official orthography of Alaska might, therefore, be treated liberally, that is to say, complicated spelling following from a strict transliteration might be simplified to a certain extent, as has been done with the spelling of many aboriginal Indian names.

Of the geographic nomenclature of Asiatic countries none has become so rapidly well known as that of the Japan Archipelago, and we can already now class Japan among the countries having an official geographic nomenclature in Roman character.

Within less than twenty years, the wonderfully progressive Japanese have established a geographic service for the survey of their domain, and a hydrographic service for the survey of their coasts and navigable waters. They have now published several hundreds of nautical charts, which are as good and practical as any published by other nations.

On those Japanese charts, which are based exclusively on their own surveys, the names are printed in the signs of the '*Kana*' with the transliteration of the name in Roman character added. It is this feature which has materially helped us to a better and correct knowledge of their geographic names. Within the last few years the *Romaji-Kwai** has made immense progress, and I understand that the society's system forms already part of the instruction in a number of schools in Japan. Hence, we may

*Society for the introduction of the Roman character for writing the Japanese language.

look forward to the day when Japanese books printed in Roman characters will supersede, to a large extent, the books in the signs of the '*Kana.*'

One of the best authorities for writing and pronouncing the names of the districts, cities, towns and villages of Japan is a very recent publication* by our honored countryman, Mr. W. N. Whitney, interpreter at the U. S. Legation at Tokyo, who compiled this admirable book with great care and labor from the official records of the Japanese empire. It not only contains the names in the original Japanese print, but what is of chief value to us, also the transcription, in accordance with the *Romaji-Kwai* system. We cannot do better, at present, than to follow this book in determining the orthography of geographic names in Japan.

In not so satisfactory a state as the orthography of Japanese geographic names is that of the countries adjacent to Japan. Considering that Asiatic names have been transcribed phonetically by explorers and surveyors of different nationalities, at different periods of time, and who were often but little, or not at all, acquainted with the languages they had to deal with, it is not surprising that many of the names we find on the charts should have been written utterly wrong. That such was the case on even comparatively recent surveys is, for instance, illustrated by the change in the nomenclature on the French plan of Cape Koan Lan, in the Gulf of Tongking (Plan No. 3721). In this French survey of 1878 the same names on the editions of 1879 and 1886, respectively, are rendered thus :

1879.	1886.
Cap Cua-Lam.	Cap Koan Lang.
Ile Capuitao.	Cai-puï-tao.
Ile Soum-La-Too.	Siong-Lai-Tao.
Ile Laito-San.	Lai-Tao.
Ile Foum-Lung.	Ile Fong Wong.

Such differences in spelling, and examples of pleonasm, as are indicated by these names, are found on the charts of all nations, but, under the beneficial working of the systems adopted by the British, French and Germans, similar errors are rapidly being corrected, and progress is being made towards international uniformity in the spelling of all geographic names.

* A concise Dictionary of the principal *roads*, *chief-towns* and *villages* of Japan, with *populations*, *post-offices*, &c.; together with Lists of *Ken*, *Kōri*, and *Railways*. By W. N. Whitney, M.D., Interpreter of the U. S. Legation, Tokyo.

Owing to the number of languages and alphabets in use in the Indian empire, the orthography of its geographic names has for a long time been in controversy. As we see from the "British System," the Royal Geographical Society has decided to spell Indian names in accordance with "Hunters' Imperial Gazetteer of India," a decision which, in view of the fact that the spelling in the Gazetteer is not always in harmony with the adopted rules, is to be regretted. But we can at the same time understand the difficulties of the situation, and appreciate the strong love of the British for old forms and long usage. The differences between the system and the Gazetteer are, however, not radical, since the continental vowel system is followed; still, it would be just as easy to write Kalkutta, Kutch, etc., for Calcutta, Cutch, etc., as it is to write Korea for Corea, and thus be consistent with the rules.

Geographic names in Malay and its branches we know mainly through Dutch, British and Spanish surveyors, and their status may be judged from the prefatory remarks in Maxwell's grammar of Malay, published in 1882, wherein he says, that the spelling of Malay words in the native character is hardly yet fixed, though the Perso-Arabic alphabet has been in use since the 13th century, and that those *follow but a vain shadow* who seek to prescribe exact modes of spelling words, regarding which even native authorities are not agreed, and of which the pronunciation may vary according to locality.

On the charts published by the Batavian Hydrographic Office, the Malay names are rendered in accordance with the Dutch phonetic system of transliteration (only that the sound of *g* is always hard) and as this differs from the British phonetic system in several particulars, it is clear that certain corrections must be applied to the spelling of "*Dutch*" Malay names to facilitate the approximately correct pronunciation of such names by English speaking peoples. But a source of trouble is the seeming uncertainty of the Batavian geographers themselves in regard to the orthography of many names, since it is a frequent occurrence to find the same names variously rendered on charts, or in sailing directions issued at short intervals of time.

We can see, from what has been said above, that chances for disagreement in the rendering of geographic names, originating in countries that do not use the Roman alphabet for their literature, are numerous, and hence, the occurrence of errors in the application of a new system should not be too harshly con-

demned ; nor would the culprits deserve to be dealt with according to the law laid down by the municipal council of the good old Swiss town of Küssnacht, which not very long ago issued a decree that the final *t* in the name of their town should be dropped in all official communications, and that any local official failing to obey this decree should be fined.

Mr. Baker : In the preparation of a map, the last things to go on are the names. If the map covers a region of country long known or thickly settled most of its features already have names. But comparison of several maps of, or writings about, a region almost invariably reveals confusion, contradictions and errors in the names. The same feature often bears different names on different maps. The same name has various spellings, and the names on the map may in their turn not agree with local usage. Examples of this confusion abound everywhere, and are a source of constant perplexity to the geographer.

The names are often misapplied. The name of one cape or mountain peak through accident, carelessness, ignorance, or by intent is often found attached to some other cape or mountain peak. A small feature's name may be extended to cover much more than that to which it fittingly belongs ; or a name rightly applicable to a large tract may be wrongly restricted to a small one. In the hands of the map-maker geographic names may be regarded as labels loosely attached and easily misplaced. Handled by many writers, both careful and careless, these labels become misplaced or lost ; and in replacing these misplaced labels or in restoring lost ones much confusion and many errors arise. The newspaper writer writing hurriedly, the magazine writer without hurry, or the book writer working deliberately, each in turn finds that the investigation of questions relating to geographic names carries him away from his subject. If a question arises respecting a non-geographic term the dictionary can be appealed to and, right or wrong, followed without discredit. But with many or most of the questions about geographic names, in the United States at least, we have no adequate dictionary or "authority" to appeal to. As a consequence in most cases the writer takes indifferently what is nearest to mind or hand and thus produces new varieties in names, variants upon old ones or quite new ones. Such names are called corrupt until usage and familiarity removes the stigma and the corrupted name having grown respectable is adopted.

A foreign name may be transliterated by one writer and translated by another. This course gives rise to two or more forms. The absence of uniform usage in transliterating, causes diversity in one case, and in the other as several translations are possible, and mistakes probable, various forms arise.

The progress of all science is intimately associated with questions of nomenclature. Modern progress in biologic science dates from the adoption of the binomial system, and it is not too much to expect that progress in geographic science will similarly be found to be intimately associated with a study of geographic names and the principles which should control in their adoption and use.

The object aimed at in these notes is to draw attention to the importance of the subject and to arouse discussion; the purpose of the discussion being to ascertain if there be not certain guiding principles which may serve to aid in solving the numerous and perplexing questions relating to geographic nomenclature.

What is a geographic name? Without attempting a categorical answer to this question I would say that geographic names seem to me to bear a strong resemblance to the names used in biology. They are generic and specific. To designate any specific geographic feature we usually use two words, *one* a descriptive term, such as river, island, lake, pond or mountain, and the *other*, a specific name indicating what particular pond, lake, or mountain is designated. The term Mississippi River is a compound name, in which river may be regarded as a part of a proper name. It is the name of a genus, whereas the term Mississippi is the specific designation. Of course it will happen in geographic names, as in biologic, that certain features or objects become so well known that a single name, either the generic or the specific will be used by itself to designate the object. We speak of Maine without prefixing the generic term "State of," the specific name being sufficiently characteristic. On the other hand here in Washington references to "the Avenue" meaning Pennsylvania Avenue are familiar to all. In this case the generic term is used for particular specification. These exceptional usages, however, do not appear to me to invalidate the general principle that the designation of geographic features consists in general of a specific and of a generic name.

The origin of generic terms has been much studied. The origin of specific names has been studied but little and the present

notes relate chiefly to this class. Specific names may be said to have two distinct origins, *first*, those of formal origin where the name has been given *pro forma* and published in a book or map relating to the region by its discoverer, or by the earliest explorers. This covers the case for a small body of names. *Second*, there is a very large body of names which appear to have arisen without such formal origin, and to have, as it were, grown up by common consent in the usage of the people of the region.

That which it seems profitable to discuss here, and now, is the principles which should be adopted and followed in the selection of the names which are to go upon the map; principles which will enable one to discriminate when usage is divided, between that which should be adopted and that which should be rejected. To make this clear, a few instances of the peculiar questions which arise may be cited, and then some of the guiding principles stated which it might be possible to adopt and to follow.

The river which flows along the western edge of New York City is locally known as the North River. Shall this be called the North River, or Hudson River, or Hudson's River? And if this geographic name is printed in the text of a book, will you print river with a capital letter or a small letter? It must be borne in mind that this question is asked not for the purpose of immediate or categorical answer, but for the purpose of eliciting thought and discussion upon the principles which should control the answer.

In 1793 Vancouver entered and mapped Port Townsend, which he formally named Port Townshend. At the present time the city situated upon that harbor, as well as the harbor itself, is universally known as Port Townsend, the "*h*" in the original being omitted. This is a clear and specific case, where the name formally applied by the original explorer is now modified in its orthography by usage. What form of the name shall be adopted? The former or original name or the present modified name? And if the original name is to be adopted, shall we proceed similarly in all cases and go back to the original form?

In the case of names which have undergone transformations through ignorance or through usage, shall an attempt be made to restore the original orthography? Take the case in Missouri of the stream called Bois Brule, or burnt wood, and which has become in the usage of the residents in that part of the world Bob Ruly, and is so spelled in the local publications, and so pronounced in the local usage.

When Champlain sailed along the heel of Cape Cod and discovered the extensive shoals which vex the navigation in those waters, he put upon his chart the statement *mal barre*, and a number of later maps applied this name to the southernmost point of the heel of Cape Cod as Malabar, and so it stood for 100 years or more as Malabar and may even be found upon some current publications. In the Coast Survey publications it is uniformly called Monomoy.

Again on the north shore of Martha's Vineyard is a place formerly known by the Indian word Kiphiggon. On the modern maps this place is called Cape Higgon. Shall we in this case adopt the practice of the purists and restore the earlier form? In this same locality are four small harbors, called by the sailors *Holes;* namely Holmes' Hole, Wood's Hole, Robinson's Hole, and Quick's Hole. In current usage, except among seamen, Holmes' Hole has disappeared and been replaced by Vineyard Haven. Wood's hole has been converted into Wood's Holl, though still pronounced hole; while Robinson and Quick still remain holes. In this case shall we attempt to be consistent, or in other words to be uniform?

In the vicinity of New Haven there is a hill occupied many years ago by Coast Survey parties, and called in their records Rabbit Rock. Surveying parties last year in searching for this station inquired diligently in the vicinity and failed to find any information respecting it for some time. The place, however, is well known to all the people for many miles around as Peter's Rock, and this name appears on the county atlas of New Haven, published in 1856. I suppose the name Rabbit Rock has found earlier publication on Coast Survey charts or in its reports, though I have not verified this supposition. But assuming that it has been so published, shall we now call that hill Rabbit Rock or Peter's Rock?

Allegany County, New York, is spelled Allegany. A post office in Sierra County, California, is spelled Alleghany; the city of Allegheny near Pittsburg, Pennsylvania, is spelled Allegheny. Shall these names be allowed to stand unchanged, or should an attempt be made to reduce them all to one form?

In the last century, the place we now know as Sitka was known to the English as Norfolk Sound, to the French as Tchinkitane Bay, and to the Russians as New Archangel. The earliest of these names being Norfolk Sound. Is there any doubt in this case as to the advisability of retaining the name Sitka?

The great sea between Northeastern Asia and Northwestern America, at one time known as the Sea of Kamchatka, and now known as Bering Sea, has been variously written Bhering Sea, Behring Sea, Beering Sea, Bering Sea, as well as all these forms with the addition of the apostrophe "s." I will not ask what is the correct name, as the question in this form seems to imply that there is a correct form, and all other forms are erroneous. The question should rather be, what form is it advisable to adopt with the view, let us hope, of securing its general adoption?

And this leads up to the question of possessives generally in specific geographic names. Many specific geographic names have the possessive form, while many others do not. Is it advisable to attempt to secure uniformity of usage in this regard? I will frankly avow my own conviction which has resulted from more or less consideration and study of the matter to be, that the use of the possessive form should be discouraged and abandoned as far as practicable. While it seems to me unwise to lay down a hard and fast rule, yet there are a very large number of cases in which the possessive form may be dropped to advantage and without, I think, arousing any general opposition to the practice. When the theory held that the King owned all, and geographic features were named for the royal family or for the nobility, the possessive form was very frequently used indicating possession or ownership, and this in cases where such possessive form has now disappeared from the maps. Why should not the possessive form be used to denote possession only? A pond, a hill, a swamp, lying on Smith's land may be properly designated as it often is, as Smith's pond, Smith's hill, etc. But nobody would think of saying Madison's Place, or Washington's Monument. There appears to be a certain principle involved. Those particular features which are of a public character, such as states, counties, towns, streets, parks, etc., which are named for individuals are almost universally named without the possessive form. And this commends itself as a reasonable practice. Without, therefore, cutting off possessives from all names where usage has now fixed them with considerable firmness, there yet remains a considerable body of geographic names in which the possessive form remains, but which are not strongly intrenched in public usage. In such cases it seems to me we may advantageously drop the possessive form. Let us say Donner Lake, not Donner's Lake, Hudson Bay, not Hudson's Bay, James Bay, not James' Bay, Baffin Bay, not Baffin's Bay, etc., etc.

MR. THOMPSON: I hardly know how I came to be brought into this discussion. The Secretary caught me in his net unawares and unprepared. I do not propose to trespass long on your time, nor do I suppose I shall add anything to a philosophical discussion of geographic nomenclature. I only wish to call your attention to a few principles that obviously should be followed in the selection of new geographic names and to show some absurdities and difficulties which are liable to occur if the sentiment in favor of Indian nomenclature is allowed full liberty. A geographic name should be short, euphonic, pronounced as spelled, and have a meaning or express some sentiment to help fix it in the memory. Especially should these principles govern when we consider that in childhood, in our school-days, we obtain by far the greater portion of our geographic knowledge.

The old Spanish explorers followed these rules largely in their geographic nomenclature, and although "Saint" and "Sierra" occur with alarming frequency, there is always some reason for the appellation; either they saw a line of peaks cut the horizon or the christening occurred on the natal day of the holy martyr. "Rio Dolores" and "Las Animas" are certainly better than "Sorrow Creek" or "Soul Wash," and even "Purgatoire"—though the Colorado cow-boy corrupts it into "Picket Wire"—is better than "Cottonwood Creek."

Some Indian names are very expressive, characterizing topographic features. In northern Arizona is a steep volcanic neck or needle, its sharp sides rising in one step twelve hundred feet above the surrounding country. From the base of this pinnacle, two long lava dykes stretch on either hand in a gentle curve across the mesa. The resemblance to the spreading wings of a bird is striking, and the Navajo Indian calls the rock "A-ga-thla"—the "Flying Bird." A name well worthy, it seems to me, of being placed on the maps of that region, as it is on the one I hold in my hand. But on the same map, close along side, is "Te-ze-ba-a-kit Lake," a barbarous appellation—unspellable, unpronounceable and unlovely. Nor can I say less in denunciation of "Zilh-le-ji-ni Mesa"—a name that needs intimate acquaintance with wigwam smoke and Navajo gutturals to handle lingually. But what shall we say of "Boo-koo-dot-klish Cañon;" the Navajo name for what the white man calls with better propriety, it seems to me, for our maps, "Bluestone Wash." "To-go-hol-tas-e Spring" could hardly be worse in English. And here is "Sa-

hot-soid-be-azh-e Cañon" (pronounce it as you please or can) sandwiched between "Gothic Wash" and "Gypsum Valley"—one hardly knows which to prefer, Indian or English.

Cañon del Muerto"—the Cañon of the Dead—so named from the discovery of mummified or rather dessicated Indian bodies in its cliffs—seems very appropriate, but its brother cañon—"Cañon de Chelly," pronounced Cañon de Shay, will be neither spoken nor written correctly.

On this same map are shown two small mesas, crowned with forests and standing beautiful and symmetric in the landscape. They attract attention at once and the Indian, with a fine sense of appropriateness, names them "Son-sa-la"—the "Twin Stars"; another name well worthy of being retained. Some patriotic American has named the deep gorge separating the "Stars" "Washington Pass," a good example of the right name in a wrong place.

The sense of broad humor that often characterizes the Indian leads him to sometimes give the inquirer a name expressive of contempt or bearing a meaning hardly translatable to ears polite —"Nic-doit-so-e Peak" is an example—and I confess, with considerable humiliation, that I was the victim in this case.

I present these instances, Mr. Chairman, to emphasize the necessity of adopting some guiding principles to aid us in the selection of geographic names.

APPENDIX.

Rules for the Orthography of Geographic Names.

CONTRIBUTED BY MR. HERRLE.

British System—French System—German System—Alphabets, Russian-English; English-Russian.

British System.

Rules adopted in 1885, by the Royal Geographical Society at London, for the Orthography of Native Names of Places.

Taking into consideration the present want of a system of geographical orthography, and the consequent confusion and variety that exist in the mode of spelling in English maps, the Council of the Royal Geographical Society have adopted the following rules for such geographical names as are not, in the countries to which they belong, written in the Roman character. These rules are identical with those adopted for the Admiralty charts, and will henceforth be used in all publications of the Society.

1. No change will be made in the orthography of foreign names in countries which use Roman letters: thus Spanish, Portuguese, Dutch, etc., names will be spelt as by the respective nations.

2. Neither will any change be made in the spelling of such names in languages which are not written in Roman character as have become by long usage familiar to English readers: thus Calcutta, Cutch, Celebes, Mecca, etc., will be retained in their present form.

3. The true sound of the word as locally pronounced will be taken as the basis of the spelling.

4. An approximation, however, to the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself. Those who desire a more accurate pronunciation of the written name must learn it on the spot by a study of local accent and peculiarities.

5. The broad features of the system are that vowels are pronounced as in Italian and consonants as in English.

6. One accent only is used, the acute, to denote the syllable on which stress is laid. This is very important, as the sounds of

many names are entirely altered by the misplacement of this "stress."

7. Every letter is pronounced. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai*, *au*, *ei*.

8. Indian names are accepted as spelt in Hunter's Gazetteer.

The amplification of the rules is given below :—

Letters.	Pronunciation and Remarks.	Examples.
a	*ah*, *a* as in *father*	Java, Banána, Somáli, Bari.
e	*eh*, *e* as in *benefit*	Tel-el-Kebír, Oléleh, Yezo, Medina, Levúka, Peru.
i	English *e*; *i* as in *ravine*; the sound of *ee* in *beet*. Thus, not *Feejee*, but	Fiji, Hindi.
o	*o* as in *mote*	Tokio.
u	long *u* as in *flute*; the sound of *oo* in *boot*. Thus, not *Zooloo*, but	Zulu, Sumatra.
	All vowels are shortened in sound by doubling the following consonant.	Yarra, Tanna, Mecca, Jidda, Bonny.
	Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.	Nuulúa, Oosima.
ai	English *i* as in *ice*	Shanghai.
au	*ow* as in *how*. Thus, not *Foochow*, but	Fuchau.
ao	is slightly different from above	Macao.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from *ey* in the English *they*.	Beirút, Beilúl.
b	English *b*.	
c	is always soft, but is so nearly the sound of *s* that it should be seldom used.	Celebes.
	If *Celebes* were not already recognized it would be written *Selebes*.	
ch	is always soft as in *church*	Chingchin.
d	English *d*.	
f	English *f*. *ph* should not be used for the sount of *f*. Thus, not *Haiphong*, but	Haifong, Nafa.
g	is always hard. (Soft *g* is given by *j*).	Galápagos.
h	is always pronounced when inserted.	
j	English *j*. *Dj* should never be put for this sound.	Japan, Jinchuen.
k	English *k*. It should always be put for the hard *c*. Thus, not *Corea*, but	Korea.
kh	The Oriental guttural	Khan.
gh	is another guttural, as in the Turkish	Dagh, Ghazi.
l, m, n	As in English.	
ng	has two separate sounds, the one hard as in the English word *finger*, the other as in *singer*. As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	

Letters.	Pronunciation and Remarks.	Examples.
p	As in English.	
q	should never be employed; *qu* is given as *kw*	Kwangtung.
r, s, t, v	As in English.	
w, x	---------- ---------- ----------	Sawákin.
y	is always a consonant, as in *yard*, and therefore should never be used as a terminal *i* or *e* being substituted.	Kikúyu.
	Thus, not *Mikindány*, but	Mikindáni.
	not *Kwaly*, but	Kwale.
z	English *z* ----------	Zulu.
	Accents should not generally be used, but where there is a very decided emphatic syllable or stress, which affects the sound of the word, it should be marked by an *acute* accent.	Tongatábu, Galápagos, Paláwan, Saráwak.

FRENCH SYSTEM.

RULES ADOPTED IN APRIL, 1886, BY THE SOCIÉTÉ DE GÉOGRAPHIE AT PARIS, FOR THE ORTHOGRAPHY OF NATIVE NAMES OF PLACES.

The geographic names in countries in which the Roman character is employed in writing (which includes the néo-Latin, Germanic, and Scandinavian languages) shall be written in the orthography of the country to which they belong.

The following rules apply solely to geographic names in countries without a written language, and to geographic names in countries where another than the Roman character is employed in writing.

Names of places for which the orthography, through long usage, has become consecrated shall, however, be excepted from the rules. Examples: La Meeque, Naples, Calcutta.

The rules in detail are:

1. The vowels *a*, *e*, *i*, and *o* are pronounced as in French, Spanish, Italian, and German. The letter *e* shall never be mute.

2. The French sound of *u* shall be represented by *u* with a *trêma* like the German *ü*.

3. The French sound *ou* shall be represented by *u*, as in Italian, Spanish, and German.

4. The French sound *eu* shall be represented by the character *œ* and be pronounced as in *œil.*

5. The lengthening of a vowel sound shall be indicated by the '*accent circonflexe*' (ˆ), and the shortening by an '*apostrophe*' (').

6. The consonants *b, d, f, j, k, l, m, n, p, q, r, t, v,* and *z* are pronounced as in French.

7. *g* and *s* have always the hard French sound, as in *gamelle, sirop.*

8. The sound represented in France by *ch* shall be written *sh.* Examples: *Kashgar, Shérif.*

9. *Kh* represents the strong and *gh* the soft Arabic guttural.

10. *Th* shall represent the articulation in the English word *path* (Greek θ), and *dh* the sound of *th* in the English word *those* (Greek δ).

11. Unless the letter *h* is employed to modify the sound of the letter preceding it, it shall always be aspirated; it should, therefore, never have an apostrophe in names beginning with it.

12. The *i* semi-vowel shall be represented by an y, pronounced as in *yole.*

13. The semi-vowel *w* is to be pronounced as in the English word *Williams.*

14. The double sounds *dj, tch, ts* shall be written with the letters which represent the sounds of which they are composed. Example: *Matshim.*

15. The *ñ*, n with a *tilde*, is to be pronounced like *gn* in *seigneur.*

16. The letters *x, c,* and *q* are not to be employed as duplicates, but the letter *q* may serve to represent the Arabian *qaf*, and the *aïn* could be represented by a double dot.

The idea is to indicate, by means of the characters above given as near as possible the local pronunciation without attempting a complete reproduction of all sounds heard.

GERMAN SYSTEM.

Rules Adopted in 1888 by the Imperial German Hydrographic Office, for the Orthography and Pronunciation of Foreign Geographic Names.

The names from nations who use the Roman or German alphabet are to be rendered in the native form, excepting such for

which a German orthography has been generally adopted, as Kopenhagen, Neapel, Genua, etc. Other foreign names which are generally known and whose orthography has been generally adopted, as Zanzibar, not *Sansibar;* Zulu, not *Sulu*, will not be changed.

The letters are pronounced as follows:

a, as *a* in *Vater.*

å, between *a* and *o* (*Ålands Inseln*).

e, as in *Eden.*

i, as in *Ida.*

o, as in *Brot.*

u, as in *nur.*

ä, (æ, Ae) } retain their German sounds.
ö, (œ, Oe) }
ü, (ue, Ue) }

ai, as in *Kaiser.*

au, as in *auch.*

ao, not quite as *one* sound.

ei, as in *Ei.*

b, d, g, h, j, k, l, m, n, p, r, s, t, w, x and z retain their German sounds.

f, retains its German sound; also for *ph*, but the latter will not be used.

c, always soft (as *z*). For the sound of *k*, *c* is not to be used.

j, for the English *j* (*dj*).

q, will not be used; it is replaced by *k;* respectively by *ku.*

ch, as *tsch.*

sh, as *sch.*

y, is only used for the consonantal sound, not for *i.*

gh, oriental guttural sound (*Dagh, Ghazi*).

kh, oriental guttural sound (*Khan*).

v, is always soft; not to be used to give the sound of *f.*

When a vowel is to be pronounced clear and open the following consonant will be doubled: (*Tanna, Mekka, Bonny*). To lengthen a vowel sound, it will not be doubled, but if the vowel is repeated each will be pronounced separately (*Nuuluha, Oosima*).

But one accent (') will be used to indicate if particularly necessary, that is, in exceptional cases, the syllable on which stress is to be laid (*Matupí*).

RUSSIAN-ENGLISH.

Russian Capital.	Russian Small.	Written Capital.	Written Small.	English equivalents.
А	а	*А*	*а*	*a*
Б	б	*Б*	*б*	*b*
В	в	*В*	*в*	*v*
Г	г	*Г*	*г*	*gh*
Д	д	*Д*	*д*	*d*
Е	е	*Е*	*е*	*e*
Ж	ж	*Ж*	*ж*	*zh*
З	з	*З*	*з*	*z*
И	и	*И*	*и*	*ī*
І	і	*І*	*і*	*i*
К	к	*К*	*к*	*k*
Л	л	*Л*	*л*	*l*
М	м	*М*	*м*	*m*
Н	н	*Н*	*н*	*n*
О	о	*О*	*о*	*o*
П	п	*П*	*п*	*p*
Р	р	*Р*	*р*	*r*
С	с	*С*	*с*	*s*
Т	т	*Т*	*т*	*t*
У	у	*У*	*у*	*u*

Russian Capital.	Russian Small.	Written Capital.	Written Small.	English equivalents.
Ф	ф	*Ф*	*ф*	*f*
Х	х	*Х*	*х*	*kh*
Ц	ц	*Ц*	*ц*	*tz*
Ч	ч	*Ч*	*ч*	*ch*
Ш	ш	*Ш*	*ш*	*sh*
Щ	щ	*Щ*	*щ*	*shch*
Ъ	ъ	*Ъ*	*ъ*	*Not indicated at end of word.*
Ы	ы	*Ы*	*ы*	*ui*
Ь	ь	*Ь*	*ь*	*Not indicated at end of word.*
Ѣ	ѣ	*Ѣ*	*ѣ*	*ye*
Э	э	*Э*	*э*	*é*
Ю	ю	*Ю*	*ю*	*yu*
Я	я	*Я*	*я*	*ya*
Ѳ	ѳ	*Ѳ*	*ѳ*	*th*
Ѵ	ѵ	*Ѵ*	*ѵ*	*x*
Й	й	*И*	*й.*	*ĭ*

ENGLISH-RUSSIAN.

a	А	*ĭ*	Й	*p*	П	*yi*	Ы
b	Б	*ĭ*	Ї	*r*	Р	*v*	В
ch	Ч	*k*	К	*s*	С	*ya*	Я
d	Д	*kh*	Х	*sh*	Ш	*ye*	Ъ
e	Е	*l*	Л	*shch*	Щ	*yu*	Ю
é	Э	*m*	М	*t*	Т	*z*	З
f	Ф	*n*	Н	*th*	Ѳ	*zh*	Ж
gh	Г	*o*	О	*ts*	Ц	‘	Ъ
i	І	*œ*	Ѵ	*u*	У	‘	Ь